THE DENTAL PRACTITIONER

Journal of Dental Science for the Practitioner

VOL. V, NO. 2 OCTOBER, 1954

[*Incorporating the Proceedings of the British Society of Periodontology and the Transactions of the British Society for the Study of Orthodontics*

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THE DENTAL PRACTITIONER

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THE

DENTAL PRACTITIONER

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Vol. V, No. 2 October, 1954

EDITORIAL

". . . OF CABBAGES AND KINGS . . ."

At this period of the year there is always a crop of exhibitions to distract us from the call of duty. We take a glance at our bank statements and decide not to visit the motor show this time. We take another look and think of the radio show and wonder if we can afford a television set. We can't. With rising rates and rents and taxes we decide that the only way to save some money is to "do it ourselves" and so pay a visit to the Handicrafts Exhibition. Here at our hearts' content we may fill our house with hundreds of gadgets of all types that will do anything. At least we can now settle down to a cheap evening's entertainment and perform those wearisome tasks about the house that never get done. They never are done, of course, even with the help of the gadgets, but the spirit is always willing. The door will still stick and the loose floor-board will still creak. But who cares, one day—maybe to-morrow—all will be done in God's good time. There are many men who just collect gadgets and never use them, while there are others who having acquired them change the characteristics and use them for an entirely different purpose. This requires a mechanical and ingenious turn of mind and undoubtedly there are many members of the profession who possess this outlook. There are men who build their own units in their surgeries and others who neatly arrange that at a turn of the foot-switch the end of the handpiece lights up and a jet of water begins to flow over the tooth. There are gadgets that have become original instruments and serve a definite purpose in the surgery. They have passed the stage of being a gadget, for although this word really means a small fitting or contrivance in machinery it usually refers to a dodge or device. The answer in fact to the question "When is a gadget not a gadget?" is when it is a scientific instrument. The demand for gadgets is high, for the majority are designed as labour-saving devices. When we consider that the general pattern of a time and motion study of a dentist at work would send an efficiency expert "around the bend", we realize why we will always be interested in gadgets. Anything that will aid us in cutting down the physical energy expended in the dental surgery without reducing our standard of work will be welcome.

THE PROSTHETIC TREATMENT OF AN UNUSUAL DEFORMITY RESULTING FROM CLOSURE OF A CLEFT PALATE IN INFANCY

By **IAN H. HESLOP**, M.B., B.S., B.D.S.(Durh.), F.D.S. R.C.S.

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THE provision of a combined denture and obturator for the patient with an extensive cleft palate of the Veau II type, which has not been closed, or of the Veau III type in which only the lip and alveolus have been approximated, does not usually cause the dental surgeon or the dental technician any undue difficulty. The æsthetic and functional results following the provision of such an appliance, combined where necessary with speech therapy, are usually quite pleasing. At least they are a great improvement on the existing state of absence of any oro-nasal seal, and almost unintelligible speech.

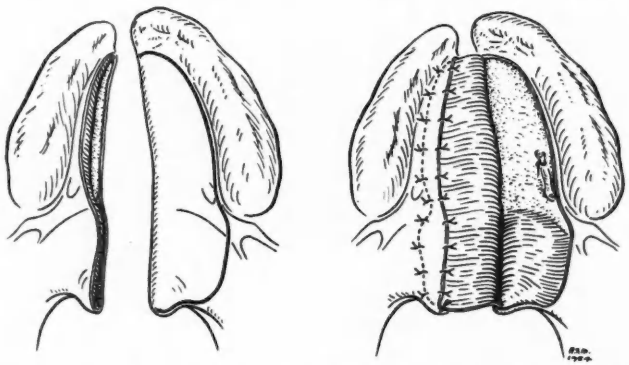


Fig. 1.—The technique used by Lane to close a cleft, the mucoperiosteal flap from one side is swung across the cleft, leaving a bare area of bone in the palate on the side from which the flap is raised.

The reasons why such appliances are relatively easy to construct and function well are not hard to see. In the anterior portion of the mouth the denture-bearing area, the alveolar ridge, is usually almost normal with a reasonably wide arch. Such hard palate as there is, is covered by normal mucosa and provides at least some retention by virtue of the surface tension between it and the denture. The presence of a cleft allows the denture to be carried a little over the palatal shelf, which furthers stability and retention of the appliance.

In the posterior portion of the mouth the soft palate hangs as a curtain on each side and moves freely up and down over the obturator, providing, together with Passavant's ridge, a good oro-nasal seal in speech and deglutition. Nowhere in the hard or soft palate are there hard knots or rigid bands of scar tissue which are so often seen following surgery, especially in those cases where less successful surgery has necessitated repeated attempts at closure of the cleft. Such scar tissue is particularly poor as a foundation for a denture.

All these findings in the untreated case are in strong contrast to the picture presented by the patient who has been submitted to surgery. Surgical closure of a cleft, particularly when this is undertaken in infancy or early childhood, or when repeated attempts at closure are made, results inevitably in considerable restriction or more frequently in destruction of the growth centres of the maxillæ. The

outcome of this is seen in the cleft-palate facies, with the flattened appearance of the middle third, poorly developed malar prominences, and apparent inferior protrusion. It would be more correct to refer to this appearance as the end-result of surgical treatment, rather than the adult manifestation of the defect initiated *in utero*.

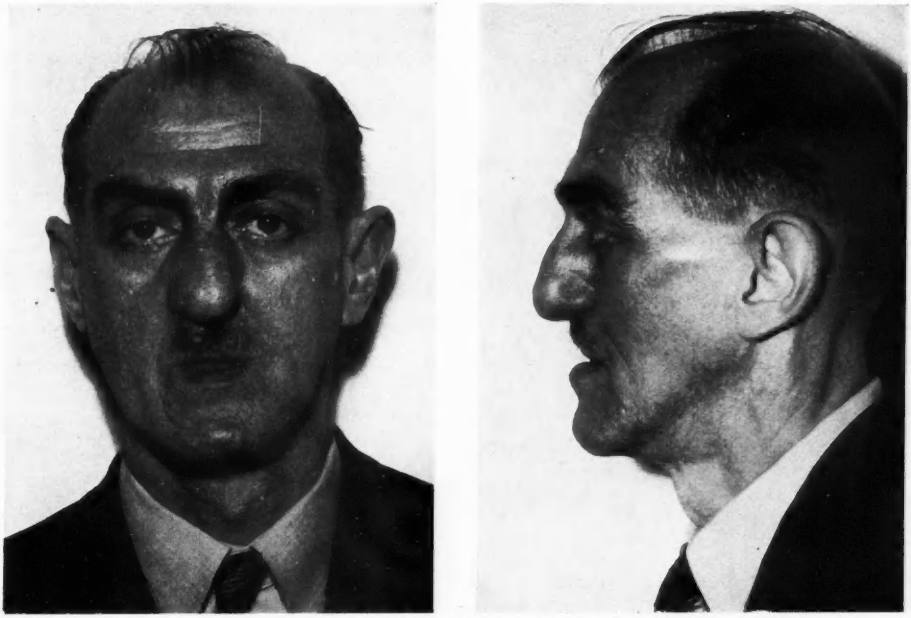


Fig. 2.—Photographs showing the typical cleft-palate facies, with a flat middle third and apparent proptosis.

Intra-orally one sees a contracted and distorted upper arch with gross disproportion between the upper and lower alveolar arches. Such gross distortion of the upper jaw was perhaps more frequent with the earlier cleft-palate operations than with present-day techniques. Most of the operative techniques which resulted in breakdown and the need for further surgery have been abandoned. The reduction in frequency of repeated operations has undoubtedly lowered the incidence of the markedly scarred and deformed palate.

One of these older techniques was that of Sir Arbuthnot Lane, in which a mucoperiosteal flap based on the margin of the cleft was dissected off the hard palate and swung across the cleft, being sutured to the opposite side (*Fig.* 1). In 1900 Lane wrote, "There is practically no limit to the amount of flap that can be obtained, since the whole of the mucoperiosteum covering the under and outer surfaces of the edentulous alveolus may be included in it". This operation must have been attended with success, at least in Lane's hands, otherwise he would not have continued to use it as he did. However, I think it is reasonable to suppose that in a number of cases infection of the denuded bone took place, with ultimate loss of at least a portion of that bone.

The two other great drawbacks of this operation are the arrest of any further oppositional bone-growth in the denuded area of the maxilla and the contraction of the flap, which accounts for much of the post-operative deformity of the jaw. It seems probable that

this happened in the reported case, and it would explain the shape and position of the

Fig. 3.—Radiograph showing maxillary-mandibular disproportion.

anterior defect and the absence of an alveolar ridge in the $\underline{5\text{–}1}|$ area.

This anterior defect could not have been caused by removal of the premaxilla in a bilateral cleft palate and lip, as this would have resulted in a more centrally placed alveolar defect.

It is outside the scope of this article to engage in a lengthy discussion of the pros and cons of the various forms of cleft-palate closure, or to discuss which should be used, at what age. Would it be best to close only the lip and the alveolus in infancy and leave all palate surgery until maxillary and facial growth are complete? There is much to be said in favour of this idea, the patient looks normal and frequently swallows and speaks at least as well with an obturator as the patient whose palate has been surgically closed.

CASE REPORT

The patient, a man of 45 years, was referred by his dental surgeon for provision of a new obturator.

He had been operated upon at the age of three weeks for closure of a cleft lip. Between the ages of 1 year and 7 years several attempts were made by Sir Arbuthnot Lane to close the palatal cleft. At the age of 21 years all the teeth except $\overline{8|8}$ were removed and a prosthesis fitted. A new prosthesis consisting of upper and lower dentures, but no obturator section, was fitted in 1950 at the age of 41 years. These dentures were retained with the aid of springs and the patient was anxious to dispense with these if possible. The dentures were loose and very mobile during speech.

On Examination.—The patient had a typical surgically treated cleft-palate facies, with a flat middle

Fig. 4.—Showing the intra-oral condition (*see* text).

third, and apparent proptosis due to lack of forward growth of the infra-orbital margins (*Fig.* 2). There was a gross degree of maxillary-mandibular disproportion (*Fig.* 3.)

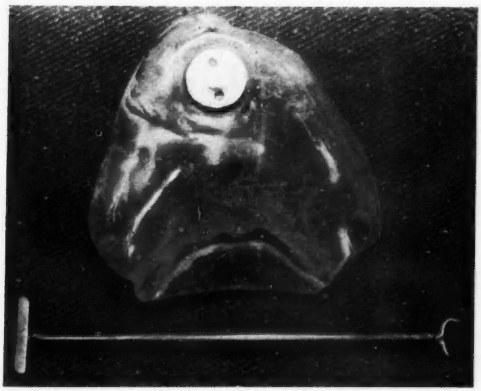
Intra-orally a most unusual state of affairs was apparent (*Fig.* 4). The upper arch was contracted, with a large anterior defect and no alveolar ridge or hard palate in the $\underline{5\text{–}1}|$ area; indeed, most of the right maxilla appeared to be absent. The remainder of the mucosa of the hard palate was badly scarred and the adjacent buccal sulcus decreased in depth. The soft palate was severely reduced in size, being represented by two minute nodules near the posterior border of the hard palate. Posteriorly this resulted in a grossly enlarged nasopharynx, which was diminished to some extent on swallowing by hypertrophy of Passavant's ridge.

TREATMENT PLAN.—

1. Construction of a clear acrylic base-plate with an extension over the posterior palatine shelf and an extension into the anterior defect in the form of two wings rotated by a key to lock over the undercuts in that defect.

A

B



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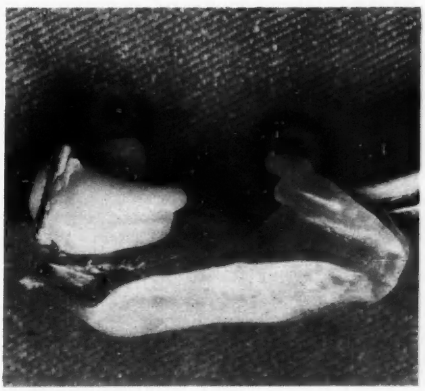


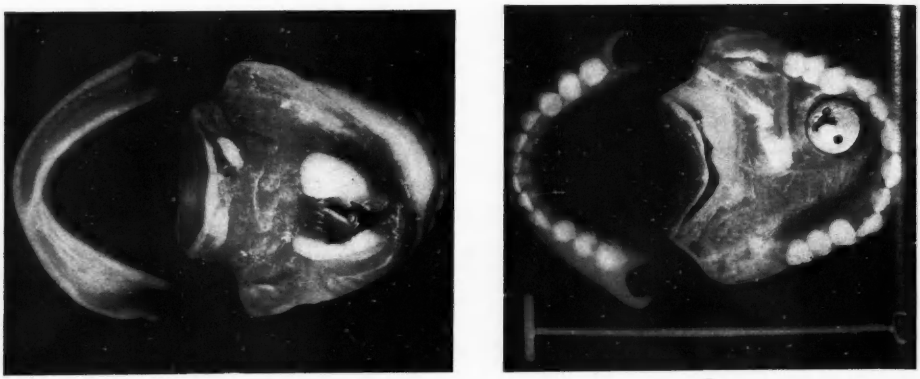
D

Fig. 5.—A, Wings locked in open position, as when denture in use. B, Wings closed, as during insertion and removal. C, Lower surface showing key and lock. D, Lateral view.

2. Addition of teeth to the upper base-plate and construction of a lower denture.

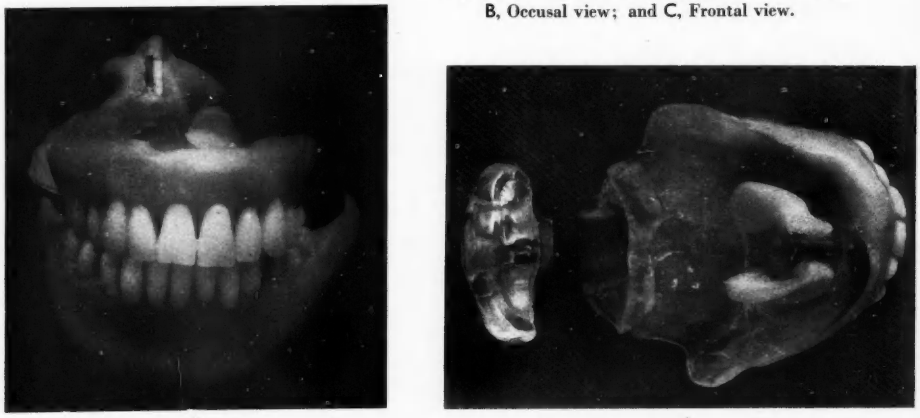
3. Addition of obturator section to the upper denture to close the posterior defect during speech and deglutition.

TREATMENT.—Upper and lower impressions were recorded in Zelex and the base-plate with extensions made as planned (*Fig.* 5). This was worn for a day, and was comfortable after a few adjustments. The bite was then recorded and the dentures tried in and finished (*Fig.* 6). A week later the patient was seen and one or

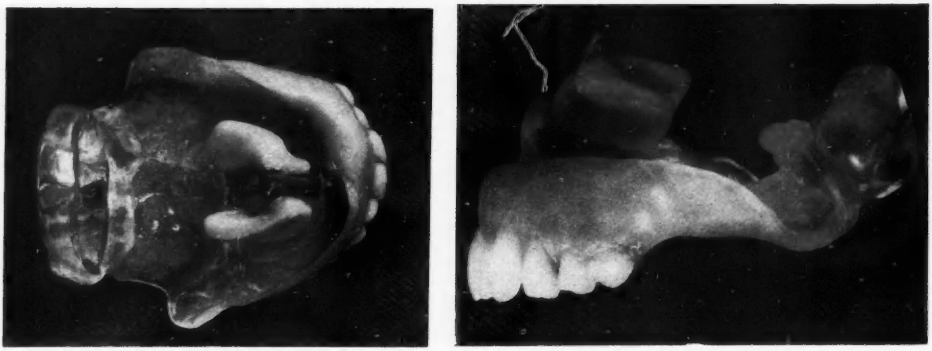


A B

Fig. 6.—The finished dentures: A, Lower surface; B, Occusal view; and C, Frontal view.



C A



B C

Fig. 7.—A, B, C, Upper denture with detachable obturator section.

two adjustments were made, after which he was discharged for a month. He was already manipulating the lock quite easily.

At the next visit a detachable obturator base was fitted to the posterior margin of the upper denture and a bung of black base-plate gutta-percha was adapted to the posterior defect. This bung was converted to clear acrylic three weeks later (*Fig.* 7).

The final result was most satisfactory and the patient had a good range of movement in which the dentures remained stable, with no dropping of the upper denture (*Fig.* 8).

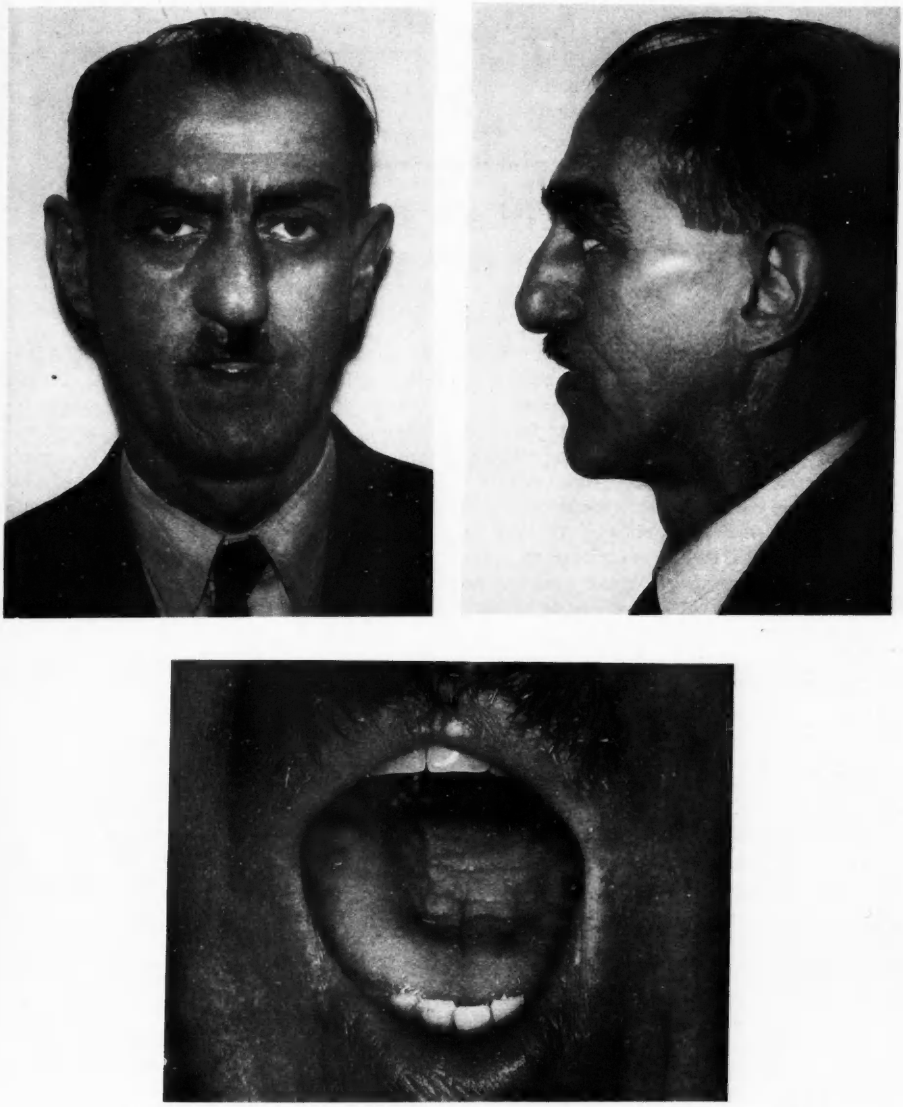


Fig. 8.—Frontal, lateral, and intra-oral photographs showing the final satisfactory result.

SUMMARY

The facial and intra-oral appearances of surgically treated and untreated cases of cleft palate are briefly discussed, with special reference to the prosthetic problems involved.

An unusual degree of mutilation of the palate is described, together with the procedures involved in providing a satisfactory prosthesis for function and æsthetics.

I should like to thank Mr. N. L. Rowe for permission to publish this case; Mr. S. Pilcher for carrying out the technical side of the case; Capt. Sibson-Drury for the drawing reproduced in *Fig.* 1; and Messrs, Ferrell and Burn, of the Department of Medical Photography, Rooksdown House, for the photographs.

REFERENCE

LANE, W. ARBUTHNOT (1900), *Cleft Palate and Adenoids, etc.*, 15. London: Medical Publishing Co. Ltd.

THE MECHANICAL PRINCIPLES OF ORTHODONTIC APPLIANCES

By **C. P. ADAMS**, B.D.S., F.D.S.

THE reader of orthodontic literature, particularly in England, cannot fail to note the regularity with which "new" appliances and methods for moving teeth are brought forward for his attention and criticism. It is probably true, however, that there is now very little that is basically new in orthodontic technique and that practice swings from one method to another and back again, depending to some extent on contemporary thought and on the personal inclination of the operator in any particular case.

There is no agreement on what appliance is best for use in any given situation, and there is in particular a tendency to think that the user of removable appliances is the "country cousin" of the operator who uses fixed appliances. There can be no doubt, however, that it is better to deal with some situations by fixed appliances and with others by removable appliances for a variety of reasons, and there should be no difficulty in selecting and using the appropriate appliance if the basic principles of design and technique are understood and applied.

THE ACTION OF ORTHODONTIC APPLIANCES

Opinion still differs on how far the influence of appliances extends through the teeth beyond the immediate alveolar bone and produces effects in the more remote parts of the jaws. There can be little doubt that the first and most obvious effect of appliances is to bring pressure or tension to bear on the teeth. This pressure or tension is in turn transmitted to the alveolar bone surrounding the roots of the teeth, which reacts in time by resorption of the existing tooth socket and deposition of new bone.

The action of appliances is most clearly apparent in those appliances which consist of a metal spring under tension, and a framework on which the spring is supported and through which the reaction of the spring is dispersed over the anchorage. Most removable appliances and labiolingual appliances making use of auxiliary springs fall into this category.

It is more difficult to analyse the action of and individual tooth pressures exerted by such appliances as the twin wire arch, the edgewise arch, and the round wire arch appliances, and, as might be expected, complicated anchorage problems arise in their use. These appliances also have the special property of being able to exert a tipping effect on the apices of the teeth, the pressure of which is not easy to assess.

The oral screen and Andresen appliance produce pressures on teeth which are also difficult to assess, because the pressures are derived from the action of the facial muscles and the muscles of mastication. The pressure exerted

through the Andresen plate at any moment will vary enormously from nothing to something more or less than the full pressure possible from the muscles of mastication, depending on whether or not the action of inclined planes is introduced.

The precise effects of traction and of screw appliances need also to be carefully considered.

THE ACTION OF REMOVABLE AND LABIOLINGUAL APPLIANCES

The action of these appliances is the action of the auxiliary springs that are used on them. In planning the design and lay-out of auxiliary springs on an appliance, it is important to design a spring that will exert a suitable pressure* over an adequate distance. There is no difficulty in making a spring with a *short* range of action, the problem more often is, within the space limitations imposed by the dental arch and the buccal sulcus, to design a spring with a sufficiently *long* range of action. The spring should also be mechanically simple so that its action is as clear as possible.

The spring that best fulfils these requirements is the finger or cantilever spring fixed at one end and free to move at the other (*Fig.* 1, A). The path of movement of the free end is, for practical purposes, at right angles to the length of the spring itself.

When designing a spring it is necessary to make it of wire of such a length and thickness that the optimum degrees of strength and flexibility are secured for the particular situation that the spring is to work in.† It is important to realize that no wire is too thick or too thin to be used for spring construction, if the following effects of range of action and pressure are borne in mind. A light pressure over however long a range of action is safe and tolerable because the periodontal tissues can sustain the pressure and react in their own time to accommodate the movement of the teeth.

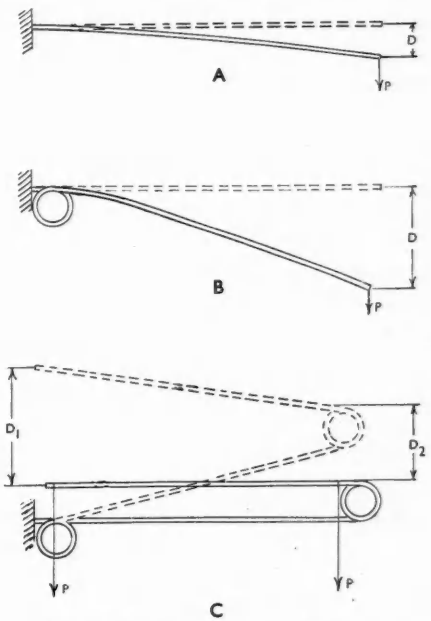


Fig. 1.—The pressure, P, is required to compress these springs to the positions shown by the unbroken lines. the springs then emit this pressure in gradually diminishing amount over the distance, D, as they return to their positions of rest.

A heavy pressure over a long range of action is dangerous because the periodontal tissues cannot react quickly enough to accommodate tooth movement and damage is produced owing to occlusion of the blood-vessels and crushing of the tissues. A huge pressure can be and is used *over a microscopic range of action* in such appliances as screw plates. These appliances produce, in fact, immediate movement of the teeth, but the movement is so small that the periodontal tissues can accommodate the change in position. If, therefore, it is

* It was found by Schwarz (1931) that the most favourable pressure with which to move a tooth is 20 g. per square centimetre of root area. Translated into terms of teeth this is, for practical purposes, equivalent to not more than 20 g. per single rooted tooth. In practice it has been found that this pressure may be increased for larger teeth—that is, molars and canines. High pressures will produce tooth movement but not necessarily any more quickly than low pressures. With heavy pressures movement takes place by undermining resorption and is accompanied by resorption of cementum and dentine in many cases.

† The formula $D \propto \frac{Pl^3}{t^4}$ expresses the relationship between the amount of deflection D, the pressure P, the length l, and the thickness t, for a cantilever spring of round section. The formula only holds true within the elastic limit of the material of which the spring is made.

necessary for any reason to use a heavy gauge of wire for a spring it must be arranged that the range of action of the spring and the pressure it exerts are within safe limits.

Two modifications of the cantilever spring that extend its usefulness are the introduction of a coil at the point of attachment of the spring and the addition of an extra limb, so forming the double cantilever spring.

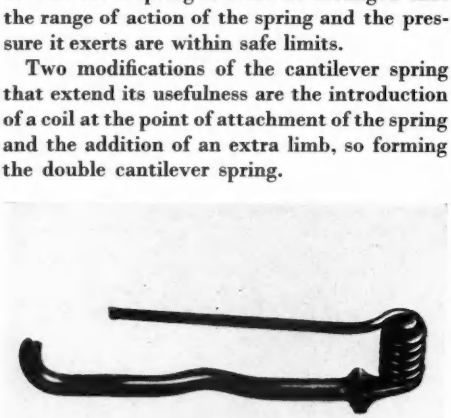


Fig. 2.—An auxiliary spring with multiple coils wound on a support. This is useful where limitations of space prevent the construction of a longer spring. The spring above is of 0·5-mm. wire, the support of 1·0 mm. wire. The end of the spring is looped around the support and soldered before the coils are wound.

The introduction of a coil at the point of attachment of the spring has the practical effect of increasing the flexibility or range of action of the spring without increasing its dimensions (*Fig.* 1, B).

In certain circumstances the number of coils may be increased to more than one (*Fig.* 2). In these instances it is important to see that the spring, while increasing its flexibility in the direction of action of the coils, does not become unstable in other directions and hence impractical in use. This drawback may be overcome by providing guides and guards for such springs. It should be remembered also that the addition of too many coils may make the spring so flexible that an excessive amount of deflection may be required before an adequate pressure is built up.

The addition of a second limb to the spring, producing a double cantilever spring, is a modification that is necessary when two or more teeth are to be moved the same distance in the same direction (*Fig.* 1, C). The amounts of pressure exerted at either end of the second limb of the spring are equalized by activating the second limb a little more than the first limb. In this way a row of teeth, such as four incisors, can be moved the same distance in the same direction in a row.*

The Application of Auxiliary Springs to Teeth.—Pressure can only be applied to teeth at a single point using auxiliary springs. It is impossible to *grasp* a tooth with an auxiliary spring. It is therefore important to see that a spring impinges on the correct point on any tooth that is to be moved. As both the spring wire and the tooth surface are hard and polished, virtually no friction exists between them so that the pressure of a spring on a tooth, even when the tooth surface slopes, is at right

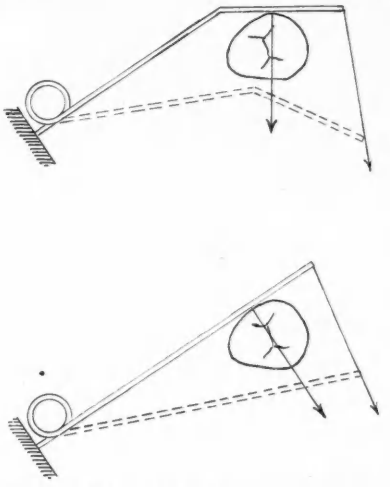


Fig. 3.—The direction in which pressure acts on a tooth does not always correspond with the direction of movement of the free end of the spring, but is determined by the point of application of the spring to the tooth.

angles to the tooth surface at that point. The direction in which a tooth is being pushed is, therefore, determined by the point at which the spring bears and not always by the direction of movement of the free end of the spring (*Fig.* 3).

* Wild (1950) discusses the action of this spring in considerable detail.

Guide Wires and Guards for Auxiliary Springs.—Auxiliary springs which are free at the active end, as often happens in removable appliances and labiolingual appliances, are liable to become displaced when in action owing to the fact that they cannot grasp the tooth but can only impinge on the hard, smooth, enamel surface. If this surface happens to be even only slightly inclined to the plane of action of the spring and not at right angles to it, the spring will tend to slip along the sloping surface then afforded. This of course will mean that the point of application of the spring

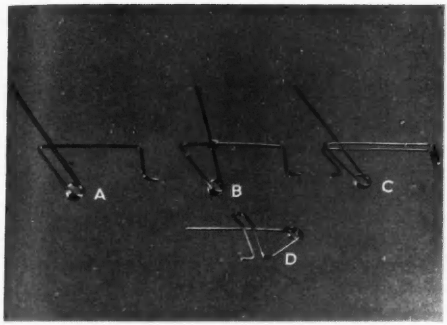


Fig. 4.—A, Spring with guide; B, Spring with guide and link; C, Spring with double guide; D, Incisor spring with guide.

becomes different from that which was intended and the wrong effect results, or the spring fails to act efficiently. A spring can be kept at its point of action by means of a guide wire which overlies the spring wire and prevents it from sliding along the tooth surface. If the action of the spring urges it against the guide wire, this alone will ensure the efficiency of the arrangement (*Fig.* 4, A). It is sometimes found after an appliance is constructed that a spring tends to move away from a guide wire. This difficulty may be overcome by linking the spring to the guide wire with a link of fine hard wire (*Figs.* 4, B, 5). If the problem of guiding a spring is anticipated while the appliance is under construction a double guide wire, one above and one below the spring, may be constructed and used (*Fig.* 4, C).

A further method of protecting and guiding auxiliary springs is to box them in under the baseplate of removable appliances (*Fig.* 6). This method has few advantages and many disadvantages. The cavity beneath the plate is an ideal site for the collection of debris and

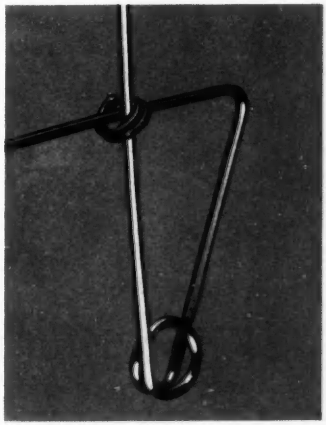


Fig. 5.—A link will hold a spring wire against the guide wire. Link is made of 0·3-mm. wire, wound around twice, cut off, and loosened by running a probe through it.

the gingival tissue can in some instances hypertrophy into it, being protected from the friction and keratinizing effect of mastication of food. The spring cannot be provided with a really smooth surface to run against. The spring may

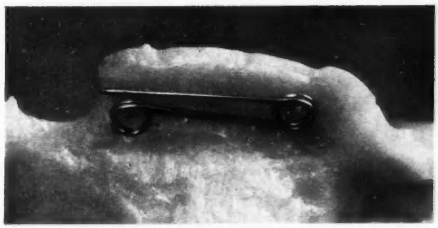


Fig. 6.—Spring guided by boxing under baseplate.

be displaced permanently away from the baseplate by carelessness on the part of the patient, and it is difficult to adjust it back into position. It is impossible to tie a spring against a plate to prevent displacement of the spring along a sloping tooth surface.

On the other hand, when a plate is weak at the point where an auxiliary spring is placed,

boxing in the spring may make the plate stronger at this point. When this is done a guide wire as well will ensure the smooth running of the spring. In certain instances, too, it is impossible to use a guide wire and in such cases boxing in the spring may be the only alternative.

As a general rule, guide wires should be placed as near to the moving end of the spring as possible in order to achieve the greatest possible degree of control over the movement of the spring. Guide wires should hold the spring down to the point at which pressure is to be put upon the tooth. As a general rule, the spring and guide wire are made so as to lie as flatly and neatly as possible against the palate or gingival tissue of the lower jaw, or neatly in the buccal or labial sulcus.

The Type of Movement produced by Removable Appliances.—As a general rule, removable appliances tilt the teeth, producing movement of the crowns. The apices of the teeth so moved may tend to a greater or lesser extent to follow the crowns. Controlled movement of the roots of the teeth cannot easily be achieved with removable appliances, and this limitation of removable appliance technique must be borne in mind when planning treatment. A limited degree of root movement can be carried out with removable appliances in certain situations.

TWIN WIRE ARCH, ROUND ARCH, EDGEWISE ARCH

These appliances cannot be analysed into a clearly distinguishable framework or fixed part and spring or active part. A number, and in some cases all, of the teeth are banded and a bracket or attachment placed on each band. The arch wire is formed to an "ideal" or any other desired shape and is ligatured into the attachments, producing a distortion of the arch wire. This distortion of the arch wire gives rise to tensions which are exerted continuously on the teeth until the arch wire has returned to its original shape, bringing the teeth with it. The amount of pressure required to distort these arches is high.* The arches are supported in short sections between the teeth, giving what is in effect a large series of very short stiff beam springs. A pressure of 20 g. does not produce a noticeable bending of such short sections of arch wire unless the wires are

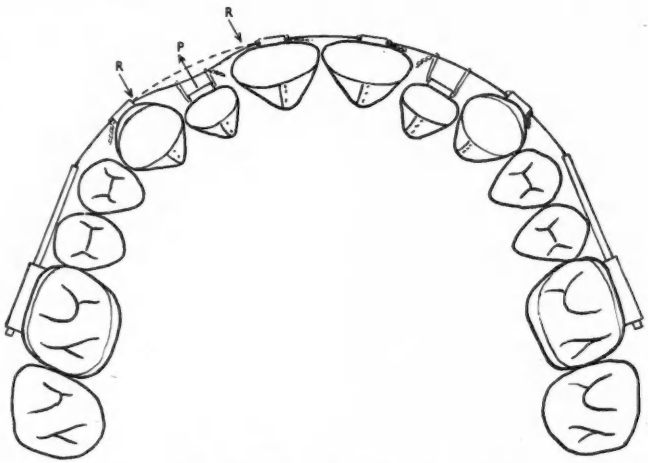


Fig. 7.—Labial movement with twin wire arch. P, Pressure on $\underline{2}|$; R, Reaction. The reaction is borne mainly by the adjoining teeth. The ligature on $|\underline{2}$ has not been tightened.

* It was found experimentally that a twin-wire arch consisting of two 0·25-mm. wires with a span from canine to central incisor of 18 mm. from the ends of the brackets from which the arch emerged, for a pressure of 200 g. gave a deflection of less than 1 mm. A pressure of 20 g. did not produce a noticeable deflection of the arch.

very fine indeed, much finer than are used in practice.

In using such appliances as these, three factors serve to limit the action of the appliances and act as protective mechanisms to the periodontal structures:—

1. While high pressures may be used, the range of action of the arches is not great.

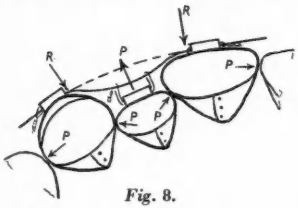


Fig. 8.

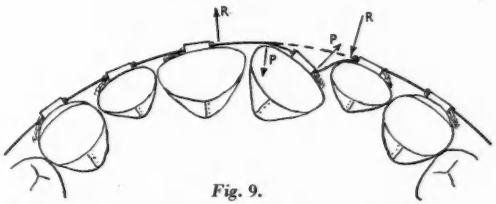


Fig. 9.

Fig. 8.—When the incisors are imbricated the full pressure, P, of the twin wire arch is not taken by the single displaced tooth. The reaction RR, remains the same on the adjoining teeth, but the pressure, P, is dispersed against their sloping lingual surfaces, forcing them apart, and hence against the two next teeth in the row.

Fig. 9.—Rotation of incisor with twin wire arch.

2. Where imbricated teeth are ligatured to the arch much pressure is dispersed through pressure of the teeth against each other.

3. The elasticity of the periodontal tissues cushions the teeth to some extent.

The basic movements that can be carried out with the arch type of appliance are:—

1. Labiolingual movement.
2. Rotation.
3. Root movement in a mesiodistal direction.
4. Depression and elevation of teeth.
5. Buccolingual and labiolingual root movement (edgewise arch only).
6. Space closure and opening.
7. The correction of arch relation by means of intermaxillary and extra-oral traction.

Labiolingual movement and rotation of incisors is particularly easily done with the Johnson twin-wire arch appliance. The two fine arch wires fall into a natural curve which is approximately the curve that it is desirable that the incisors and canine teeth should occupy. When the arch wires are ligatured into the brackets fixed to these teeth, pressures and tensions are brought to bear on the displaced teeth. If the irregularity is severe, as in *Fig.* 7, and the arch wires have a high modulus of elasticity, and are ligatured completely into all displaced tooth brackets, very severe pressures can be placed on teeth if there is space for them to move into. In *Fig.* 8, however, the lateral incisor is impacted between the canine and the central incisor, so that much of the pressure released by the twin wire arch is dispersed against the canine and central incisor, and this results in a tendency for these teeth to move apart, if they are free to do so. If they are not free to move, the pressure is further dispersed against the next teeth in the arch on either side. A persistent attempt to

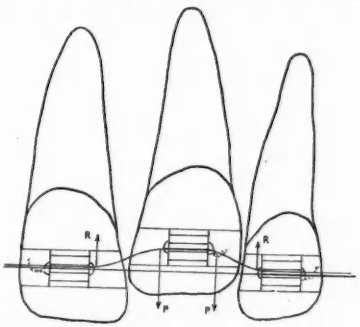


Fig. 10.—Elongation of tooth with twin wire arch. Light pressure is used; the reaction is unlikely to upset the adjoining teeth.

aline incisors which are imbricated and for which no room exists or has been made in the arch will, through this tendency to spreading of the arch, produce an expansion in a forward direction and a resulting increase in overjet.

The same mechanism is used to produce rotation with the twin wire arch (*Fig.* 9). A mechanical couple bears on the rotated tooth, bringing it automatically into correct alinement as the arch wires return to their position of rest.

Depression and elevation of individual incisor teeth is also easily carried out with the twin wire arch. Where a tooth is to be elongated it is usual only to ligature one of the arch wires into the channel because it is necessary to exert a very gentle force for this particular movement. The apical vessels and nerves are particularly susceptible to injury by excessive elongating forces (*Fig.* 10).

A special property of the "arch" type of appliance is that of being able to tip the apices of the teeth in various directions. If the arch wire does not run parallel to the channel in the bracket on a tooth (*Fig.* 11, A) the arch must be deformed before it can be fitted into the channel and ligatured into place (*Fig.* 11, B). The tensions in the arch wire which result tip the tooth in a mesiodistal direction. The relative degrees of movement of the apex and the crown can be controlled by either preventing the crown from moving, in which case most movement will take place at the apex (*Fig.* 11, D), or by assisting the crown in moving in which case most of the movement will take place at the crown and the apex will hardly move at all (*Fig.* 11, C).

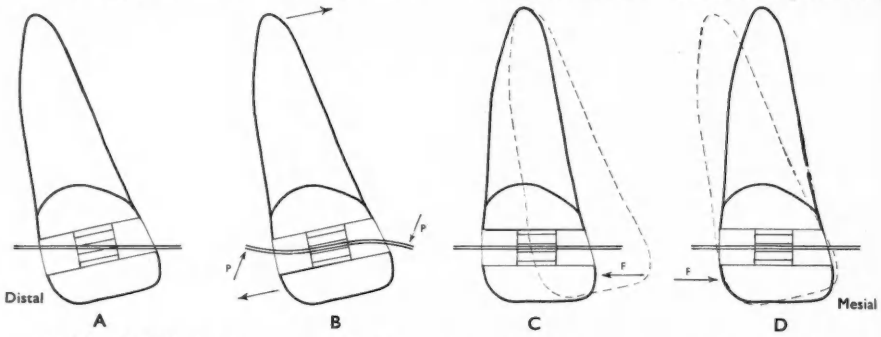


Fig. 11.—Mesiodistal root movement with the twin wire arch. A, Arch passive. B, Arch must be deformed to get into the bracket. The resulting pressures tend to move root mesially, crown distally. C, If crown is assisted by force, F, movement will be mostly at the crown. D, If crown is stabilized with force, F, movement will take place entirely at the apex.

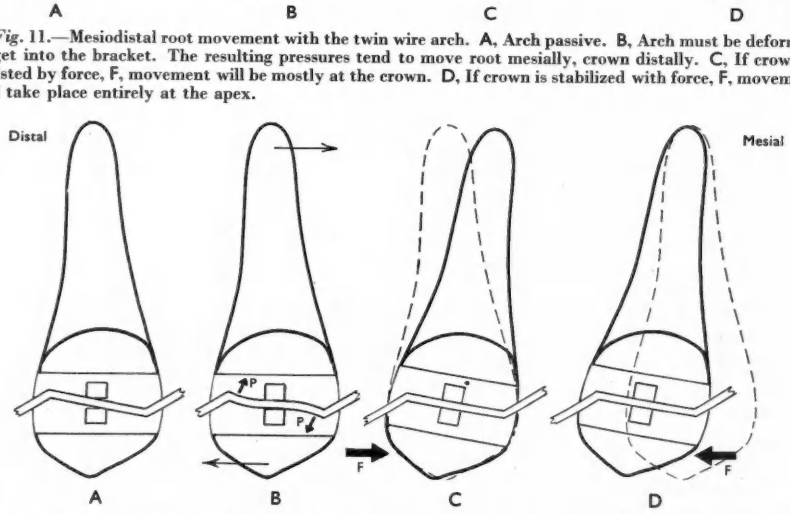


Fig. 12.—The edgewise arch—second-order bends. A, The passive arch crosses the bracket at an angle. B, The arch wire is deformed in order to get it into the channel and the resulting pressures, PP, tend to tilt the apex mesially, the crown distally. C, If the crown is stabilized with a force, F, movement takes place at the apex. D, If the crown is assisted to move by force, F, main movement will take place at crown and not at apex.

Mesiodistal root movement can be effected in the buccal segments either with the "round arch" or with the edgewise arch with the use of second-order bends (*Fig.* 12). Where the arch crosses the bracket channels, it is stepped so that it crosses the channel obliquely. The arch therefore has to be twisted almost straight before it can be seated in the channel and the resulting stresses tend to tip the tooth mesiodistally. Here again, the crown tends to move in the opposite direction to the apex, and this tendency may be prevented or encouraged depending on the relative amounts of crown and root movement required. This process of tipping the teeth in the buccal segments may be applied to all the teeth in a buccal segment simultaneously by fitting an arch which has a series of steps. Each step corresponds to the channel in the bracket on a tooth in the buccal segment. In order to seat the arch in the brackets, the steps must be straightened slightly and as a result a tipping force is brought to bear on every tooth in the buccal segment which is caused to tip *en masse* at the crowns or at the apices as the operator desires.

A further root movement that may be performed with the edgewise arch is bucco- or labiolingual movement of the apices of the teeth by twisting or torquing the arch (*Fig.* 13). The arch wire fits very accurately into the brackets on the bands and the twist in the arch is transformed into a tipping in a labio-lingual direction of front teeth or in a bucco-lingual direction of the cheek teeth.

As already mentioned, all these appliances give rise to complicated anchorage problems. The reaction from the stressed sections of the arches are applied directly to the adjoining teeth and, on account of the continuity of the dental arch, to the teeth immediately beyond. The effect of these forces of reaction have to be carefully assessed and appropriate steps taken to make sure than no unwanted tooth movements take place.

Intermaxillary and extra-oral traction are frequently used with all these appliances for the purpose of correcting arch relationships and for securing adequate anchorage in some cases. There is an extensive literature dealing with these fixed appliances, and it is impossible here to do more than indicate the elementary principles of their action. The reader is referred to more extensive works which give the many refinements that are incorporated in the appliances in the treatment of various types of case.

It would be naïve to assume that in practice a tooth will move in response to the arch type

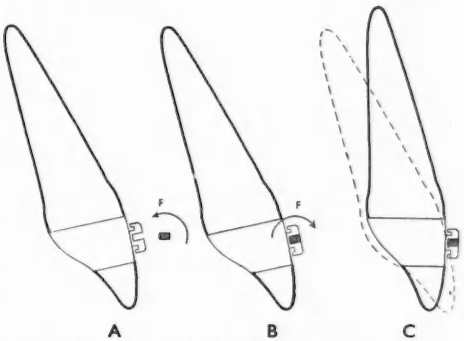


Fig. 13.—Torque force applied to an incisor using the edgewise arch for labial root movement. **A**, The arch must be twisted with a force, **F**, to aline it with the channel in the bracket and permit insertion. **B**, The arch then exerts force, **F**, tipping the apex of the tooth labially. The amount of pressure exerted on the labial plate of bone is difficult to assess clinically. **C**, Movement produced by torque force.

of appliance exactly as planned according to the mechanical action of the section of arch applied to it. These appliances introduce such a complexity of pressures and reactions into the dental arch that it is sometimes difficult or impossible to assess exactly how much pressure is being applied at any one spot. Furthermore, root form influences the movement of the teeth mechanically and the small alterations in occlusal relation and the relation of the teeth in the same arch affects the distribution of stress from day to day. Lastly, the alveolar bone is a living tissue and it does not always react in a purely mechanical way to mechanical stresses.

When an arch type of appliance has been planned and put into position, it must be carefully watched and accurate assessments made of changes that occur and particular care taken that relative movements are not mistaken for the particular movements that are the objectives aimed at.

(*To be continued in a subsequent issue.*)

A SYMPOSIUM ON CLEFT PALATE

I. SURGERY. II. THE ORTHODONTIC PROBLEM

A Précis of the Discussion following the Papers given by W. G. Holdsworth (see Vol. IV, p. 380) and M. A. Kettle (see Vol. V, p. 23) at the February Meeting of the British Society for the Study of Orthodontics.

Professor J. Whillis, in opening the discussion, said that he had not been the first to describe the naso-pharyngeal sphincter muscle, as Mr. Holdsworth had said. It was Wardill who had first described it; Wardill had prognosticated that it would be there, and when they had looked for it they had found that it was there. This muscle was not attached to the hamulus; it missed the hamulus and went into the hard palate itself, so that it would not exert much of a pull on the hamulus itself.

The procedure of dividing the hamulus was supported by the contention that it allowed freedom to bring the parts together. That might be true, but the division of the tendon of the tensor, which Mr. Holdsworth carried out, would do precisely the same thing. Wardill stated that dividing the hamulus converted the tensor into a levator, but personally he thought that was nonsense. The tensor was a muscle which was concerned with depressing the palate, and it would therefore work whenever the palate was depressed. In closing the naso-pharyngeal sphincter the palate was elevated, and the central nervous system did not play tricks like that.

One point which he thought was of very great importance, and to which Mr. Holdsworth referred, was the relationship of the time of operation to the development of correct speech. It had been his experience that there were two groups of patients. Some of them, being provided with a normal mechanism at an early stage, would learn to speak normally, and that confirmed the view that the time at which to do the primary operation was before the child had learned to speak at all. There were, however, some children who did not learn to speak properly, and there must be some reason why normal speech did not develop in these children. Some might have a faulty organization of the central nervous system, and there were two forms which that might take. One was that hearing was deficient. Some patients could not tell the difference between their speech and any normal person's speech, and there was something odd about that. It was very difficult to see how such a patient could learn to speak normally. In these patients all the efforts made to produce a normal machinery of speech failed. There were other cases, however, which were left alone completely and yet spoke just as well as and perhaps better than many of the cases in which the palate had been repaired. These patients had somehow learned to compensate for their deformity.

Therefore he did not think that the problem was quite so simple as would at first appear from the better results in those cases in which the palate was repaired before the children learned to speak; but that, in his opinion, did not alter the principle that the time to do any operative procedure to provide a suitable mechanism was before the child had learned wrong habits of speech, which were very difficult indeed to lose once they had been acquired. For instance, when many of these children quarrelled with their brothers or sisters they went back to cleft-palate speech, even when the surgeon, the speech therapist, and the mother thought that their speech had become normal. In such cases the speech had become normal by voluntary effort, and when the speech became of an automatic character it was apt to revert to cleft-palate speech.

The problem of the effect of the lip on the development of the jaws seemed to him to be exemplified to some extent by the cases of cleft lip without cleft palate. If the lip was exerting a restraining influence on the development of the maxilla, one would see cases in which the development of the maxilla was deficient when the palate was normal, and, of course, one did see such cases, so obviously it must have some effect, but his impression was that the maldevelopments of the maxilla in such cases were minimal, and therefore the palate itself must have something to do with the deficient development of the maxilla. Mr. Holdsworth had mentioned the evils of stripping, and he thought that that was a point which needed a great deal of further investigation and the collection of data. He thought that most surgeons were beginning to agree with Mr. Holdsworth that the results of stripping might be disastrous, owing to the interference with appositional bone growth.

With regard to Mr. Kettle's paper, he would like to refer first to the author's point about avoiding the time of sutural growth for operative procedures. During the early stage of growth, sutural growth contributed very little, and therefore operative procedures performed at that time would be less likely to disturb it. He would like to refer, secondly, to the timing of Abbé's operation to increase the length of the upper lip. If these occlusal deformities occurred, and if they became more pronounced during the period when sutural growth was at its maximum, Abbé's operation, if it was to be done at all, must be done before that period, although the effect of the tight lip was less pronounced at that time.

There was one very significant point that Mr. Kettle had made. In describing one of his cases, he had said that the vertical height of the maxilla was deficient. That vertical height was, of course, the result of sutural growth and appositional growth, and it seemed to him that, if there was a real suppression of vertical growth, it indicated something inherently wrong in the tissues which were growing, because it was basal bone that was chiefly concerned, and not alveolar or palatal bone. If vertical height deficiency was due to the lack of alveolar growth, it would be a different matter, and he would like Mr. Kettle to clear up this point, because if it referred to basal bone he thought it was likely to indicate a deficient growth in the maxillary tissue, which he thought was present. Neither Mr. Holdsworth nor Mr. Kettle had made much mention of something inherently wrong in the make-up of these tissues which prevented them growing properly.

Mr. Kettle had referred to the tongue bulging into the cleft; Professor Whillis said he would like to suggest that, if the tongue was bulging into a cleft, it was of necessity narrowed from side to side, and that the

disturbance of the position of the segments of the maxilla when the lip was repaired might therefore, if the palate was not repaired at or about the same time, be due to a deficient lateral pressure of the tongue, because, since it was bulging upwards into the cleft, it could not bulge sideways and forward against the alveoli. It had never struck him before, but it struck him now, that part of the imbalance might be due to the fact that the tongue was not working properly, because it was bulging somewhere where it normally did not bulge, namely, into the cleft, and in that connexion the normal development of the arches, in cases in which an obturator was fitted and no attempt was made to repair the cleft, might be partly due to the fact that the tongue was then unable to bulge into the cleft and so remained of a normal breadth, producing its normal pressure against the teeth and the alveoli, which led to the normal expansion of the arch.

Mr. E. A. Hardy said that members were fortunate to have Mr. Holdsworth to describe the operation now used for cleft palate. His paper, together with the slides, had made the method very clear. He personally would have liked to hear more about this operation which was more important to orthodontists than operations on cleft lip.

Many people believed that cleft in the alveolar bone could unite, but this was not so, and only slight pressure on the teeth would open up the cleft.

He thought the fundamentals to be considered in these cases were, in their right order: (1) Speech; (2) Mastication; and (3) Appearance. If preferred, appearance could be put before mastication, but speech must always be considered first. The tight upper lips, referred to by Mr. Kettle, could be greatly softened by an orthodontic appliance.

Mr. D. S. Hayton-Williams said that one person of great importance in the work under discussion was the expert anæsthetist who enabled surgeons to carry out unhurried and precise operations. The type of operation performed was of less importance than the date. There were other people concerned, such as the speech therapist and orthodontist. It would help the surgeon and orthodontist if, when cleft lip and palate cases were discussed, the type was clearly defined.

The orthodontic problem was a complicated one. The plastic surgeon had only a few hours' work on an unconscious patient, whereas the orthodontist might have to work over a number of years on a conscious and possibly unco-operative patient. In his opinion, complicated procedures could not satisfactorily be executed by a dental surgeon on the written instructions of an orthodontist.

Mr. J. H. Hovell raised the point whether in cleft palate there was, in addition to the cleft deformity, a difference in the growth potential of the deformed parts. He personally was not sure that this was so. In primitive parts of the world he had seen untreated clefts (admittedly not severe ones) in which the development of the dental arches was normal. It was most important to attempt to determine whether there was growth deficiency in cleft palate, in order to find out how much the operative procedures interfered with growth. He felt that much interference *was* caused, both by the disturbance of growing parts and by formation of scar tissue. The cases with greatest deformity were those in which numerous operations had been undertaken to close clefts in the hard palate.

Mr. D. F. Glass said he had been appalled by the knots of scar tissue left behind after cleft-palate operations which orthodontists were supposed to try to stretch and move about. The older operations were the main cause of the deformity, apart from the developmental cause. In the case of the push-back operation, a picture had been shown in which nearly the whole of the hard palate had been stripped and pushed back, and there was a large area of scar tissue left each side of the palate, while the nerve-supply to the mucous tissue of the soft palate was, or probably would be, interfered with. Scar tissue was present and he thought the collapse of the two lateral sides of the dental arches was due to this, because it became worse as time went on. Unless orthodontic treatment was given between the ages of 4 and 5 years, the collapse of the lesser segment could actually be seen. The median displacement of the buccal segment was, in his opinion, due almost entirely to scar tissue.

He was not convinced that sutural growth of the palate was of great importance after 3 years because most of it had taken place by then. In any case, the sutural growth of the palate did not matter in cleft-palate cases when there was no growth in the soft palate. It was the middle sutures which gave the width of the palate.

He would like to ask Mr. Holdsworth whether he found speech difficulty when adenoids were removed after the palate had been closed, and whether the constriction of the muscles affected the palate after tonsillectomy.

He thought that in the selection of cases for speech therapy, it was the patient's I.Q. that mattered more than anything. Many of them had other developmental defects, both mental and physical.

He did not agree with Mr. Kettle that the earlier palatal clefts were operated upon the better. He thought that operation should be avoided as long as possible and that some system should be adopted whereby the palate was not stripped, but a graft was introduced to prevent tension across the palate.

Cleft lip and palate surgery was a little beyond the field of orthodontists, but as they were left to treat the chaos that remained after the operations, they ought to have some say in the matter. At present there was great lack of co-operation between surgeons and orthodontists.

Mr. W. J. Tulley said he had seen a child of 9 with untreated cleft lip and palate whose speech and oral development were excellent. He had seen a family with cleft-palate speech of a genetic pattern but without cleft palate. The whole problem was extremely obscure.

To-day plastic surgeons considered the orthodontic problem very fully, and, owing to improved technique, orthodontists did not see the gross distortions they had seen in the past. The orthodontic problem was proportional not so much to the surgical technique as to the lack of tissue. Tissue could not be increased without some being introduced into the mouth, which was now being done. The real orthodontic problems occurred in complete clefts, bilateral cleft lip and cleft hard and soft palate, but even in these cases the premaxilla element varied and the amount of tissue was one of the factors to be considered.

Obviously contracting scar tissue had something to do with failure of growth, as had the disproportionate elements of lip and tongue pressures; but he did not agree with Mr. Kettle that the septum was such an important factor in the pathological cases he had shown.

He thought one of Mr. Kettle's most important statements was on the question of the superimposition of

cleft-palate abnormalities on other skeletal abnormalities. There might be a Class II or a Class III case with a cleft palate, and the problem was directly related to the genetic build-up of the patient apart from the actual deformity.

Mr. J. C. Ritchie wished to know whether Mr. Holdsworth was in the habit of splinting his cleft-palate repairs when teeth were present. A number of cases he had treated had been splinted at the time of operation and he believed this greatly reduced deformity. He believed that these repairs, whether done by surgery or stimulation, should be completed before speech began.

Mr. H. E. Wilson, speaking of the downward growth of the middle third, recalled a paper read before the Society by Dr. Scott, of Belfast, who had convinced most of his hearers that downward growth did not take place at the suture after the second or third year but was mainly appositional growth. Mr. Kettle had shown an illustration demonstrating the effect of sutural growth in the downward direction and he thought Professor Whillis agreed that this was the mode of growth. He would like Mr. Kettle's views.

Mr. Holdsworth, in replying to the discussion, said Mr. Glass had raised an important point about adenoids and tonsils. He had seen more than one child whose palate had been closed with a good speech result which was jeopardized by removal of adenoids later. He did not like adenoids being removed in such children. He had seen no harm result from removal of tonsils provided the soft palate was undamaged. Shortage of tissue was fundamental in all the work in question—the surgeons tried to make something and had not enough tissue. He was grateful for Mr. Ritchie's suggestion about splinting when teeth were present.

Mr. M. A. Kettle, in replying to the discussion, said that Professor Whillis mentioned the effect of the lip in the development of the upper arch when there was a cleft there but not necessarily in the palate. The point to be considered was that the cleft might involve the deeper structures in the nose. If it did, there was a defect in the forward growth of the arch.

He thought the vertical height of the upper arch was both alveolar and basal. It was caused by the forward growth of the upper arch and the downward pressure due to the nasal septum coming together and pushing down, so he thought the effect of the nasal septum was considerable. The alveolar bones would also have an effect because the soft tissues present might displace or retard the downward growth of the teeth.

The tongue bulging in the cleft did not necessarily result in its becoming narrow; indeed, the tongue in cleft-palate children was much wider than normal. The point was that the freeway space was greatly increased so that the tongue bulged sideways between the teeth in the resting position and during swallowing.

He did not agree that the sutural growth of the palate was complete before 3 years. There was a great increase in the anteroposterior length of the palate after 5 years. Labial displacement of the buccal segments was not necessarily related to scar tissue in the palate, because it occurred before operation. It was mainly due to lip action.

Mr. Glass had referred to the graft coming across the defect in the palate. He had said in his paper that any interference with the vomer would decrease that growth.

Mr. Tulley had mentioned cases in which some mucous nasal resection was done. If it had been done early an orthodontist who followed up the cases would probably have been able to show some effect on the upper arch.

Mr. Wilson had suggested that the downward growth of the middle third was appositional. The remarks he had made in his paper had been based on the suggestion that it was sutural growth.

As to lack of co-operation between surgeons and orthodontists, he thought some were lucky and others not.

CONTROLLED TOOTH MOVEMENT

By **C. V. HILL**, B.D.Sc., *Eastman Dental Hospital*

(*Continued from page* 13)

We shall now consider some common cases with extraction of units and describe the actual application of technique, contrasting desired tooth movements in different types of cases.

Take the skeletal 1, Class I case with forward shift of all four buccal segments, probably with buccal occlusion normal, or nearly so, but with imbrication of upper and lower incisors and perhaps insufficient room for the canines. Here, inasmuch as there is a discrepancy in the size relationship of tooth to basal bone (apical base), then the ideal treatment resolves itself into extraction of four units followed by sufficient distal movement of the canines to allow alinement of the incisors and then closing the remaining space by mesial movement of the buccal segment. Care is taken not to allow a lingual collapse of the lower labial segment, but to maintain it in optimal position in muscle balance between the tongue and lips. It may be necessary to retract the upper labial segment a little to obtain correct upper to lower canine relationship together with a good incisor relationship.

The $\frac{4|4}{4|4}$ having been extracted, the following teeth in the lower are banded: $\overline{65321}|\overline{12356}$. An arch of 0·45 mm. with third-power bends from $\overline{3}$–$\overline{1}|$ and $|\overline{1}$–$\overline{3}$ to move $\overline{2}|\overline{2}$ into alinement is used. The force of the third-power bends is distributed amongst all the incisors, and whilst the $\overline{2}|\overline{2}$ are drawn labially to the

arch, the distal arm of the third-power bend resting on the mesial surface of the canine exerts pressure, so tending to move the canine distally along the arch. The arch must be turned down immediately distal to the tubes on the $\overline{6|6}$, so acting as a stop and establishing the arch length when proclination of the labial segment will not result. Alternatively, a tie-back stop may be used to tie the arch back to buccal segments. It is now advisable to change to a 0·55 mm. arch wire with space-closing loops on each side between $\frac{5\text{–}3|3\text{–}5}{5\text{–}3|3\text{–}5}$. However, if the tie stop is tied back to the distal of the arch, i.e., the distal of the molar, then it is acting really as intra-traction, producing the same result as a rubber from a loop on the arch in the canine region to the end of

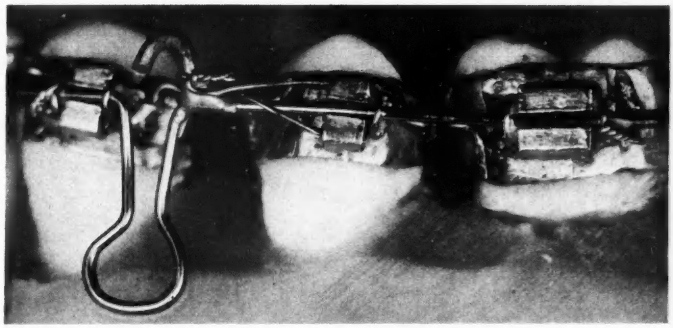


Fig. 23.—Space-closing loop activated by ligating from distal of $\overline{|5}$ to tie-back stop. Arch is free-sliding through $\overline{|6}$, and $\overline{|5}$ is brought forward individually. Subsequent activation by ligating loop open moves $\overline{|5}$ into contact with $\overline{|3}$.

the molar. A light traction may be used from the distal end of the arch, i.e., using $\overline{65|56}$ as anchorage to retract the $\overline{3|3}$ individually by means of an individual traction loop whilst an eyelet is also welded to the distal of the canine bands to prevent them rotating as they move distally. In this case we have no worry about the forward movement of the $\overline{65|56}$ as a forward movement of the buccal segment is desirable.

In the upper jaw $\underline{65321|12356}$ are banded and the required tooth movement is again distal movement of the canines sufficient to aline the incisors. An arch similar in all respects to that used in the lower is inserted, but here, owing to the buccal segment $\underline{65|56}$ drifting forward more readily than in the lower, it is preferable to use intermaxillary traction from the distal end of the lower arch for individual traction of the upper canines, from an individual traction loop.

Having alined the incisors upper and lower, the remaining spaces must be closed, ***but from the rear***, i.e., by forward movement of the the arch distal to the molar. In the lower this would probably result in a collapse of the labial segment by being retracted lingually against the $\overline{65|56}$ buccal anchorage. To counteract this a change is made in the anchorage. Using $\overline{321|123}$ as anchorage, with the mesial arm of the space-closing loop acting as a stop at the distal of the canine bracket, so binding the labial segment as a complete anchorage unit, the ligatures ligating the $\overline{5|5}$ to the arch wire are tied mesially, then continued on and ligated round the tie-back stop, and the space-closing loop is so activated by this ligation. The arch is left free-sliding through the $\overline{6|6}$, so that the traction comes individually to the $\overline{5|5}$ (*Fig.* 23).

The space-closing loop is reactivated at each subsequent visit until the $\overline{5|5}$ are in contact with the $\overline{3|3}$. It may have been necessary to get the upper labial segment a little farther back to correct the upper to lower canine relationship, in which case it would be possible to use intermaxillary traction from a loop on the upper arch, which at the same time tends

to move the $\overline{6|6}$ forward. If no more intermaxillary traction is available (the upper labial segment being in correct canine relationship with the lower), then a similar space-closing arch as before is used in the lower with $\overline{5321|1235}$ as anchorage to close finally the space by forward movement of $\overline{6|6}$. It may be possible to obviate changing the arch by ligating the $\overline{5|5}$ to the $\overline{3|3}$ brackets, so including the $\overline{5|5}$ in the labial anchorage and using rubber traction from a loop previously bent in the arch mesial to the canine to the end of the arch distal to the $\overline{6|6}$, so closing the remaining space. A similar procedure may be necessary in the upper jaw to get the $\underline{5|5}$ in contact with the $\underline{3|3}$ and finally the $\underline{6|6}$ forward to close the spaces. The buccal occlusion should now be correct, with cuspal interdigitation, and if the $\frac{5\text{–}3|3\text{–}5}{5\text{–}3|3\text{–}5}$ are tilted or leaning, then they may be uprighted with an auxiliary arch as previously explained.

In complete contrast to the previous case is the bimaxillary or double proclination, where both upper and lower labial segments are proclinated. To reduce the proclination it is obvious that extractions must be resorted to for the purpose of gaining available space. The desired tooth movements are the greatest distal movement of the labial segments with the least possible forward movement of the buccal segments. To achieve this, due consideration must be given to the maximum available buccal anchorage. This is obtained when $\frac{4|4}{4|4}$ are automatically the extractions of choice. To further supplement the buccal anchorage, it is advisable, if possible, to band the $\overline{7|7}$ when $\overline{765|567}$ is then used as anchorage to retract the $\overline{3|3}$ individually. This is important as the only available form of traction in the lower is intramaxillary, whereas in the upper extra-oral may also be used, but this is somewhat difficult to arrange in the lower jaw. The incisors quite often are in good alinement. The $\overline{765321|123567}$ are banded and a 0·55-mm. arch inserted and fitted securely in the brackets of $\overline{765|567}$. This bracket engagement constitutes the maximum anchorage, whilst the $\overline{3|3}$ are retracted individually with the eyelet on a distal of the canine bands tied to the arch to prevent the canine rotating lingually.

It is essential that the bracket engagement of the arch in the buccal teeth must be complete to use this anchorage to the greatest

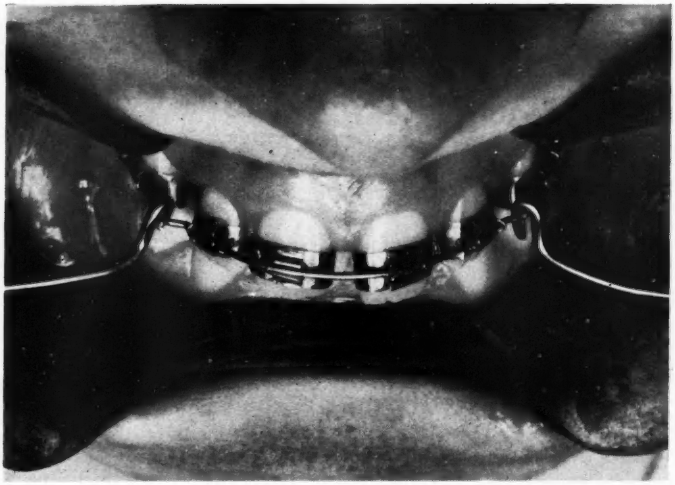


Fig. 24.—After retraction of canines, arch is bent out immediately distal to brackets on laterals to clear mesial corner of canines.

advantage. Any form of intra-traction (rubber or pull coil) from the distal end of the arch is used to retract the $\overline{3|3}$ until they are in contact with the $\overline{5|5}$. (There are quite a number of alternative methods available for canine retraction. Sectional arches will briefly be mentioned later.) Spaces are now present between the canines and the laterals. To prevent the four incisor teeth from spacing, a ligature from the lateral on one side across the labial to the distal of the lateral on the other side may be tied at commencement of treatment. Alternatively, stops may be used distal to the bracket on each lateral, so holding the four incisors as a unit. Otherwise, as the canines are retracted, spacing tends to occur between the incisor teeth as they drift around the arch.

Fig. 25.—Cervical is attached distal to stop to retract canine individually. Can later be used mesial to stop to retract labial segment.

At this stage a new 0·55 mm. arch wire is made to retract the four incisors. A normal ideal arch may catch on the mesial corners of the canines, so preventing the retraction of the incisor units. To obviate this, the arch is bent out at right angles immediately distal to the brackets on the laterals, so acting as stops which hold the four incisors together as one unit. The arch at this site is bent out 2 mm., and then again bent at right angles so that it clears the mesial corners of the canines and runs free-sliding through the brackets of the buccal teeth. This bend is kept in a level occlusal plane and a traction loop is incorporated immediately on the distal arm of the arch to which intramaxillary traction is used from the distal of the arch for the retraction of the four incisors. Care must be taken in order that the traction loop itself does not contact the mesial corners of the canines as the incisors are retracted. It is also necessary to tie back the canines to the distal of the arch to ensure that the canines do not drift forward during retraction of the incisors (*Fig.* 24).

In the upper the treatment plan is similar, individual traction (very light) being used to the canines from the distal end of the lower arch during the day, whilst at night extra-oral may be used hooked over the arch mesial to the canines for individual traction, the distal eyelet on the canine band again being tied to the arch to prevent rotation. It may be indicated that a straight pull to the canines is desirable from the distal of the arch. This must be done with great care. To minimize the forward shift of the buccal segments it is advisable to stop the arch immediately mesial

to the brackets on the 5|5, whilst intermaxillary traction may be used to the loop mesial to the canines in the upper arch so holding the 765|567 back, whilst the canines are retracted with intramaxillary traction. Here, again, extra-oral or cervical traction may be used at night mesial to the traction loop itself on the upper arch when the buccal segments are held back whilst the canines are retracted individually with intra-traction, or alternatively the extra-oral may alone be used for retraction of the canine when it is applied distal to the traction loop but mesial to the canine (*Fig.* 25).

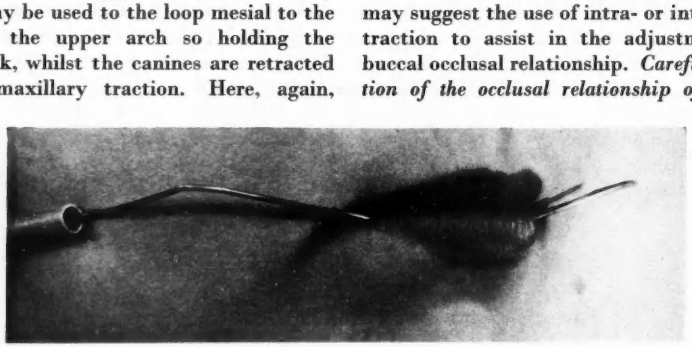


Fig. 26.—Cervical traction clear of the cheeks. Does not interfere with lips at point of entry.

When the canines are moved distally until they are contacting the 5|5, a change is made to an arch similar to that used in the lower, clear of the mesial corners of the canines with stops distal to the bracket on the lateral, free-sliding through the brackets of the buccal teeth, so retracting the four incisors as a unit. Extra-oral or cervical may be used here also, and too great stress cannot be placed on the importance of this type of traction (*Figs.* 26, 27).

Careful observation of the buccal occlusion may suggest the use of intra- or intermaxillary traction to assist in the adjustment of the buccal occlusal relationship. *Careful consideration of the occlusal relationship of the buccal teeth is all-important in the selection of the type of traction and anchorage to be used at every stage of the treatment of a case.*

Some mention must be made of the use of sectional arches and the retraction of canines.

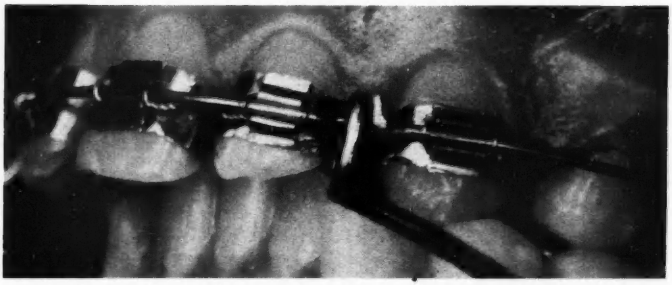


Fig. 27.—Cervical attached mesial to stop on arch to retract labial segment.

Dependent on the axial inclination of the canines is the type of sectional appliance which may be used.

When a canine has quite a degree of mesial inclination then a considerable movement is obtainable by merely uprighting a canine by retracting the crown, i.e., tilting the tooth. However, if the axial inclination of the canine is completely upright then it becomes necessary to move the apex of the tooth distally also. The anchorage in both these cases is identical to the case already explained, i.e., 765|567 is used as anchorage to retract the canine. *Fig.* 28 shows a retracting loop which is used for the retraction of a canine with a

mesial inclination, where it is sufficient to upright the tooth by tilting the crown distally. The arch must have complete bracket engagement in the buccal segment with a space-closing loop immediately distal to the canine bracket. The distal arm of the arch may be tied back with a tie-back stop so that the loop is activated and so retracts the canine. Further activation may be made at each subsequent visit (*Fig.* 28), until the $\overline{3}|$ is in contact with the $\overline{5}|$. A similar arch is used for distal apical movements of the canines. *Fig.* 29 shows a rectangular arch with a space-closing loop. To effect distal apical movement the mesial arm of the arch is offset across the bracket of the tooth so that when the arch is engaged in the bracket it is obvious that the resultant force would be transmitted in such a way as to move the apex distally. At the same time activation for retraction is achieved by ligating the tie-back stop, so activating the space-closing loop. It is possible to produce this movement with a round 0·55 mm. arch which fits accurately into the bracket, but greater control is obtained by using a rectangular wire.

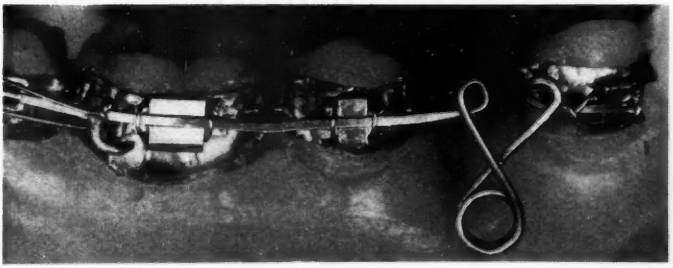


Fig. 28.—Sectional arch for retraction of $\overline{3}|$ is activated by ligating tie-back stop around distal end of arch. Note buccal anchorage of $\overline{765}|$.

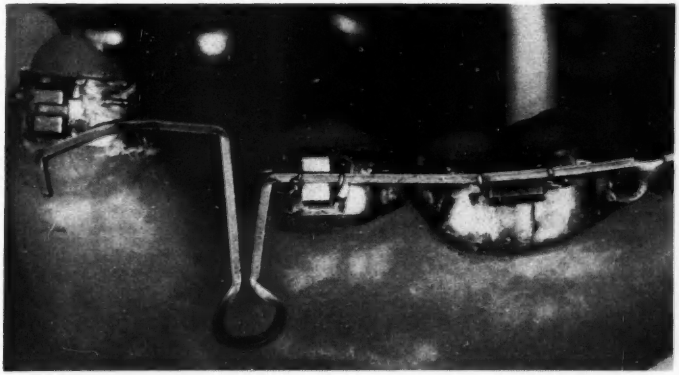


Fig. 29.—Rectangular sectional arch for distal apical movement of $|\overline{3}$. Apical movement is achieved by ligating mesial arm of arch in $|\overline{3}$ bracket. Retraction of $|\overline{3}$ with apical movement is obtained by ligating tie-back stop, so activating loop.

A sectional arch of the whip type may be used for assisting a tooth to erupt when the remaining teeth of the arch are in good occlusion and alinement (*Figs.* 30, 31).

In those cases where upper $\underline{7}|\underline{7}$ are the extractions of choice, the $\underline{6}|\underline{6}$ may be moved distally by various methods: $\underline{6321}|\underline{1236}$ may be banded and a 0·55 mm. arch with traction loops mesial to the canines is inserted with a

passive open coil, at the mesial end of which is a sliding-tube traction hook which lies just distal of the canine (*see Fig.* 15). The canines also have an individual traction loop. This then allows intermaxillary traction (if available) to be used during the day to the sliding hook which compresses the coil, so moving the 6|6 distally, whilst at night the intermaxillary traction may be continued, when the cervical may be used mesial to 3|3 to retract the 3|3 individually and later on either intermaxillary traction or cervical may be changed to the loop on the arch mesial to the 3|3, so retracting the labial segment. Here you have three sites to which either cervical or intermaxillary traction may be applied, to move:—

a. 6|6 distally,
b. 543|345 distally,
c. the 21|12 distally without a change of arch.

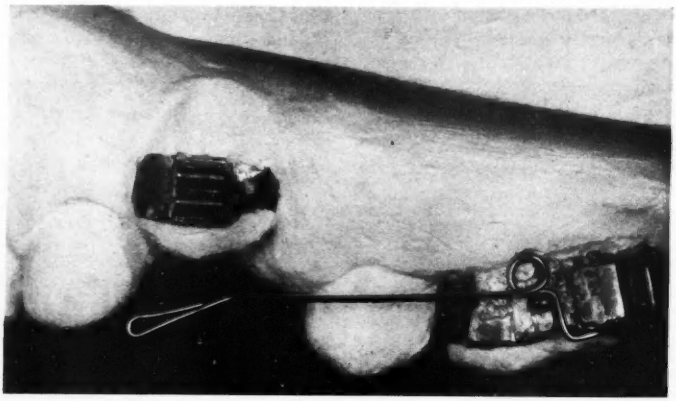


Fig. 30.—Sectional "whip" arch for assisting eruption of canine. Note self-locking adjustment in double tube of molar (*actual case*).

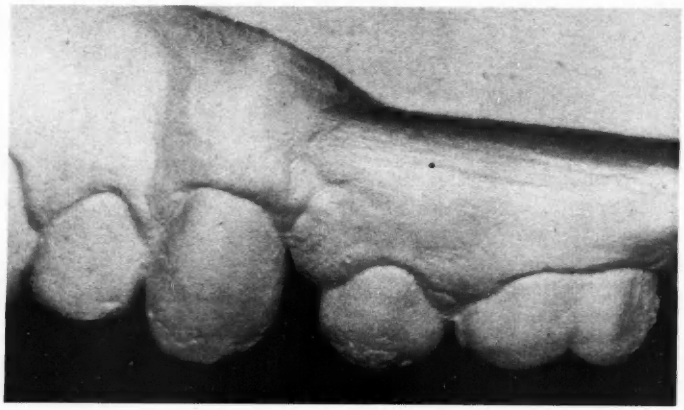


Fig. 31.—Result of *Fig.* 30.

When the $\frac{6|6}{6|6}$ are extracted very little can be done in the lower until the 7|7 can be banded. Once they are banded there is available ample intramaxillary traction for the

retraction of the lower canines to allow alinement of the labial segment. In the upper, owing to the speed with which the 7|7 drift mesially, it is at times advisable to stop the arch immediately mesial to the 7|7, so holding them back whilst intermaxillary traction is used to retract the 543|345. Again, cervical is recommended and probably essential in this type of case. Once the 543|345 have been retracted distally sufficiently, then inter- or intramaxillary, or cervical traction may be used to retract the 21|12.

Unfortunately these cases often present with a marked mesial inclination of the 7|7, and the first essential is to upright these teeth by mesial movement of the apices. Owing to this mesial inclination it is unnecessary to offset the brackets on the molars. A fairly long U-loop is used with an arch of 0·45 mm. between the 75|57. To engage the distal end of the U-loop in the 7|7 tube is in itself quite often sufficient activation to initiate the uprighting of the tooth. However, it is important to pull the distal end of the arch through the tube, turning it down immediately distal to the tube, thus acting as a stop, so that in effect the crown is at least held in its present position whilst the apex is brought mesially, so uprighting the tooth. As the degree of mesial lean is lessened, a change of arch may be made to a thicker one of 0·55 mm. to complete uprighting, continuing with a U-loop for this purpose.

Cross-bites may be easily corrected by wearing intermaxillary rubbers from an attachment on the palatal surface on the upper molar band to an attachment on the buccal surface of the lower molar band. It is also possible to correct a unilateral cross-bite by using as anchorage on the one side all the teeth in the buccal segment and activating the arch on the opposite side in such a way that it whips the molar buccally. The arch on this side is tied back to the molar, but is not tied into the remaining teeth in the buccal segment, i.e., 6543| is used as anchorage on one side to whip |6 out on the other side.

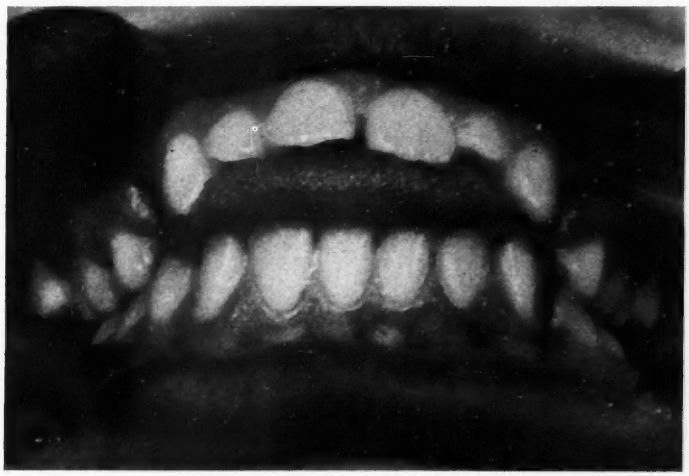


Fig. 32.—Marked anterior open bite. 4|4 have been extracted. Treatment was retraction of labial segment and elongation to obtain an overbite.

Elongation of Incisors.—Appreciation of a multi-band therapy is evident in the ability to elongate the upper labial segment in a case of tongue thrust with marked anterior open bite (*Fig.* 32). Quite often the buccal segments have moved forward so that the 4|4 are extracted to make space for retraction of the six anterior teeth. Care is taken to select anchorage in such a way that the buccal segments do not

move too far forward. The 3|3 are retracted until they are in contact with the 5|5. If a level arch of 0·45 mm. was inserted, too much force would be exerted on the four incisors. The arch is therefore de-activated to an extent where it lies passive some 4–6 mm. below the incisor bracket towards incisal edge. It is now ligated into the incisor brackets whilst traction is applied to the loops distal to the 2|2. The tendency is to elongate the incisors, as they are banded. If they are in good occlusal alignement with the buccal segment, i.e., do not themselves require depressing, then they are banded and included in the buccal anchorage. If, on the other hand, they also require depressing, then it may be advisable not to include them at this stage. Recalling that to any action there is an equal and opposite reaction, the buccal segment is used as anchorage whilst the labial units are depressed. An

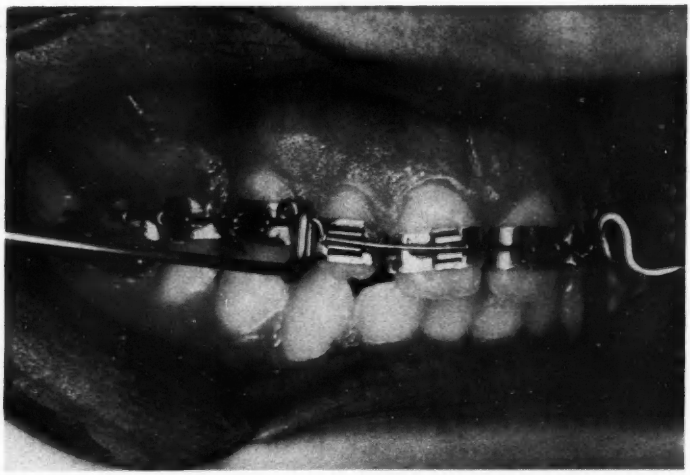


Fig. 33.—Same case as in *Fig.* 32 with labial segment completely retracted. Cervical being worn. Note "step down" in arch for elongation of labial segment and establishment of overbite.

retracted with suitable traction. This arch may be activated to further elongate the teeth or a new arch may be inserted. When the four incisor teeth are in contact with the 3|3 an arch may be activated further to produce an overbite. It may be sufficient to bend the arch down in a curve on both sides just mesial to the 3|3, or it may be necessary to use an arch which is stepped down in the 3|3 region (*Fig.* 33).

Depression of Incisors.—This quite often is desirable in a Class II, Div. 1 case where the lower incisors have over-erupted and bite into the palate. In order to effect this depression of the lower labial segment it is necessary to band as many of the buccal teeth as possible. Dependent on the position of the canines is whether or not they should at this stage be arch is inserted which lies passively in the brackets of the buccal anchorage, whilst in the labial segment it lies passively above the gingival margin or even lower in the direction of the labial sulcus, dependent on the size of the arch wire used and the degree of over-eruption of the labial segment. If this arch is ligated into all the brackets of the teeth it is evident that whilst the labial segment is depressed there is a reaction tending to elongate or erupt slightly the teeth in the buccal anchorage. After this first arch of 0·45 mm. has been in position for three weeks it becomes necessary to activate the arch in the canine region so the labial section of the arch again lies in its passive state 4–6 mm. below the bracket level gingivally. A complete change of arch may be made to 0·55 mm.,

when as this arch is stronger the degree of activity required would be less. When the four incisors have been depressed to the level of the canines it may be necessary to band the canines activating the arch immediately distal to the canines in order to also effect their depression. When depressing any labial segment it is essential to establish the arch strength. Failure to do this, i.e., leaving the arch free-sliding through the buccal segment, results quite often in the proclining of the labial segment, which is undesirable. The arch, having been ligated into all the brackets, is turned down or tied back with a tie stop to the distal of the arch.

Perhaps it would be appropriate here to issue a word of warning: If a tooth does not move in response to pressure, look carefully for the cause. Make certain that the bracket is free-sliding and not caught on the arch. This is more likely to occur when the arch wire is fitting accurately in the bracket, as when using an arch wire of 0·022 in. (Teeth seem to move more easily along an arch when the arch has play in the bracket.) This may sometimes happen with the canines. In those

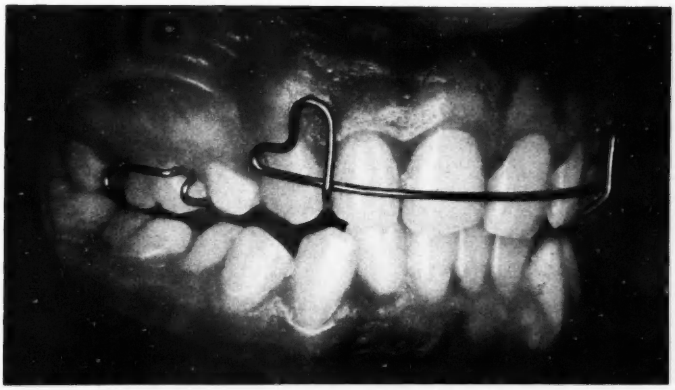


Fig. 34.—Retaining plate in position. There is not an open bite. Taken this way for photographic reasons.

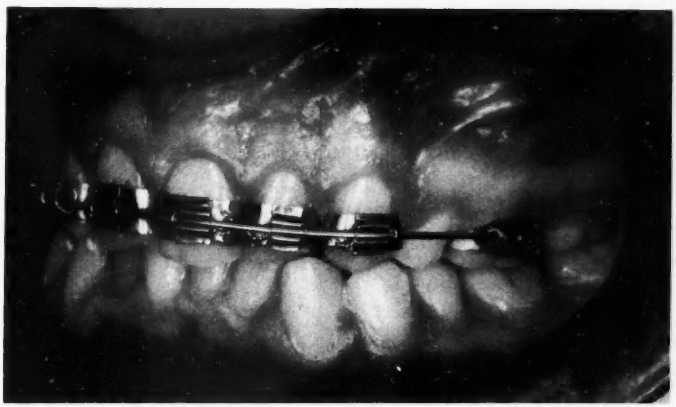


Fig. 35.—Patient, aged 15. For certain reasons, treatment was confined to upper jaw only. $\frac{4|4}{}$ were extracted, $\frac{3|3}{}$ retracted with pull coils and cervical traction; $\frac{21|12}{}$ were retracted solely by cervical traction.

cases where the canine can be tilted distally to upright it, and traction is continued until the crown is tilted distally, a point is reached where no further distal movement of the canine is obtained. It is essential then to move the apex distally, so uprighting the tooth again. If further distal movement is required it is advisable to move the apex back first.

Fig. 36.—Same patient before treatment.

Fig. 37.—Same patient after treatment.

Fig. 38.—Full-face before treatment.

Fig. 39.—Full-face after treatment. (*Figs.* 14, 24, 25, 27, 34, 35, 36, 37, 38, and 39 are serial photographs of the same case.)

When all tooth movements are completed and the buccal occlusion upper to lower has been corrected, it now remains to retain the case. The best retainer initially is the actual arch wire itself; having been turned down distally or tied back, it is advisable to leave the case for two months. Owing to the spaces which are quite often present on removal of all the bands, it is suggested that some of the bands be removed, still leaving one or two in the labial segment and tying the arch back to close the spaces before finally taking off the arch and remaining bands. Rotations particularly must be held. (It is advisable to correct rotations as early as possible in the treatment of a case.) It is essential to inset a retaining plate within a few days after removal of the bands (*Fig.* 34). This plate may be of the Hawley type. Slight corrections and tooth movements may be achieved by the retaining plate itself. Andresen plates also have a place

as means of retention. It is preferable that the plates be worn day and night for a length of time dependent on the type of tooth movements made in the particular case, and then finally they may be worn at night only.

Fig. 40.—Full-face before treatment. Patient, aged 19 years, with an extremely marked anterior open bite.

Fig. 41.—Full-face after treatment. $\frac{4|4}{}$ were extracted. (*Figs.* 26, 32, 33, 40, and 41 are serial photographs of this case.)

It must here be stressed that the multi-band technique in no way displaces other techniques; in fact it is suggested that both labio-lingual and removable appliances are most useful techniques, which may quite often be used in collaboration with multi-band.

I wish to express my thanks to Mr. C. F. Ballard, Head of the Orthodontic Department, Eastman Dental Hospital, for permission to publish photographs of treated cases; and to Mr. MacDougall, of the Photographic Department, Eastman Dental Hospital.

ABSTRACTS
from Other Journals

Amalgam Restorations

Amalgam has proved its excellence as a permanent restorative material. It only does so when the dentist follows the simple rules of the scientifically sound procedure, and there are so many variables under his control which so greatly influence the result. Cavity preparation is of prime importance. The cavities should be properly extended for prevention. The resistance and retention form of the cavity preparation must be greater for amalgam than for gold inlay restoration. The frail walls should be sufficiently cut down. All carious dentine must be removed, as the enamel walls should rest on sound dentine. The finer details and the toilet of the cavity should be completed within a dry field wherever possible. Where a cement base is to be placed in deep-seated cavities, the bulk of the cement should be kept small. The field must be kept dry during condensation, as the moisture, in any form, causes corrosion of the amalgam and delayed expansion. If a matrix is to be used it should be a thin, highly polished stainless steel strip of ·0015 in. in thickness, which is securely reinforced by low fusing modelling compound, as the matrix should always be wedged at the gingival margin. The alloy should have a high silver content and should be of a fine cut. The correct alloy/mercury ratio as suggested by the manufacturers should be strictly adhered to and the method of manipulating amalgam should be under

constant supervision, as under-trituration increases expansion whilst over-trituration may cause shrinkage. For triturating amalgam a rubber finger-stall or a mechanical amalgamator may be used. Additional mercury should never be added to the amalgamated mass after trituration has been started. It is important that a uniformly dry mass be used by expressing a considerable amount of mercury from the mass immediately after trituration and that it should be condensed rapidly with the use of heavy packing pressure. It is this stage in the technique which calls for all the skill and knowledge of the dentist, and it distinguishes very sharply between the good and the poor amalgam worker.

Once the amalgam is condensed there will be no dimensional change due to moisture contamination. An amalgam restoration which is highly polished is more resistant to corrosion and tarnish. It is preferable to delay the final polishing for several days in order to permit the restoration to obtain a state of metallurgical equilibrium. Wet pumice followed by wet whiting will give the final restoration a mirror-like polish. Care should be taken, however, to avoid frictional heat.—ROMNES, A. F. (1953), *Int. dent. J.*, **4**, 4.

Diamond Stone

In describing diamond stones for cavity preparation the following observations are made:—

1. They are most efficient instruments for removing enamel.

2. For greatest efficiency, the highest attainable speed of revolution, the largest convenient diameter of instrument, and the lightest possible touch should be used.

3. To control temperature rise in the pulp and lessen clogging of the instrument, the stone should be kept moistened with water.

4. Small diamond instruments are relatively inefficient at the available speeds of revolution.

5. Diamond instruments are not suitable for removing metallic fillings, soft dentine, and caries.

6. Diamond stones should be combined with carbide burs where small instruments are indicated, and with steel burs for removing soft dentine and caries. Chisels should be used for chipping away unsupported enamel.

7. The long working life of diamond stones permits the adoption of standardization procedures.—WALSH, J. P. (1953), *Int. dent. J.*, **4**, 38.

Development of Penicillin-resistant Organisms

An investigation into the effect of constant use of a dentifrice containing penicillin has been conducted by the authors over a period of one year. Nearly five hundred schoolchildren brushed their teeth once a day at school and were urged to do the same twice a day at home. The dentifrice contained the procaine salt containing approximately 1,000 units per gramme. A control group of children used a dentifrice with no penicillin. Cultures were made from the penicillin dentifrice users and from the control group, and the various organisms classified. Studies were made of the penicillin sensitivity of these organisms after one year's use of the dentifrice.

The conclusion which was reached was that in the users of penicillin there was a greater percentage of individuals having resistant *Str. viridans* and other organisms than in non-users, and that this fact may be of clinical significance.—HILL, T. J., SIMS, J., and NEWMAN, M. (1953), *J. dent. Res.*, **32**, 4.

Cortisone and Healing of Extraction Wounds

It has been observed that various wounds such as biopsy sites and decubitus ulcers in patients undergoing ACTH treatment were very slow to heal. As this form of treatment is becoming more common, the possible clinical problem which may arise as far as the dentist is concerned prompted the author of this paper to conduct an investigation into the effect of cortisone on the healing of extraction wounds in the rat.

Sixty-five female albino rats were used. They were divided into groups of five experimental and four control animals. The experimental groups were injected with cortisone acetate. A maxillary molar tooth was extracted from each animal: the animals were then sacrificed

at intervals, histological sections being made of injected and control animals.

An examination of the results showed little final difference in the healing between treated and untreated animals, although there was some evidence of delayed healing, the chief defect appearing to be a retardation of maturation of connective-tissue replacement. These findings are not in accord with other wound healing studies in different species, and may be partially explained by the relative resistance of the rat to cortisone.—SHAFER, W. G. (1954), *J. dent. Res.*, **33**, 4.

Angular Stomatitis and its Association with Artificial Dentures

In investigating a series of cases of angular stomatitis associated with artificial dentures, the following conclusions were reached:—

There are several aetiological factors—infection, ariboflavinosis, generalized seborrhœic or flexural eczema, sensitization to dental materials and malocclusion—concerning the production of angular stomatitis and therefore a full investigation of each case is necessary.

Patch tests to denture materials may be delayed and patches should be left in situ for at least 96 hours. The nature of the sensitizing material remains obscure, but may be connected with the colouring material. Opening of the dental bite will result in the cure of some cases, but cannot be guaranteed to be permanent.

Most of these patients show a local infective cause for the condition, or have some dental fault, or both.—HARKNESS, J. G. (1954), *Brit. med. J.*, **2**, 1415.

SOCIETY NOTES

FEDERATION DENTAIRE INTERNATIONALE

Annual Meeting, Scheveningen, Netherlands

THE XLIInd Annual Meeting of the Fédération Dentaire Internationale took place this year in Scheveningen, Netherlands, from June 8 to 13, and was held in conjunction with the Jubilee Congress of the three Dutch Dental Associations, which were celebrating respectively their seventy-fifth, fiftieth, and fortieth anniversaries.

The Organizing Committee, under the able guidance of Dr. C. F. L. Nord, Honorary President of the F.D.I., staged an ambitious Scientific Programme at the Kurhaus Hotel, Scheveningen, consisting of a number of panel discussions on the subject of Preventive Dentistry.

The programme was divided into: (1) Prevention of Dental Caries; (2) Prevention of Orthodontic Deviations; (3) Prevention of Periodontal Diseases; (4) Preventive Dentistry from the Sociological and Economic Angle.

There were two or three papers on each main subject followed by a panel discussion by a number of experts led by a Chairman, who discussed the papers which had been read earlier. At the final session, held on the Saturday morning, a panel consisting of those who had read papers and the Chairmen of the various panels on each subject, under the Chairmanship of Dr. C. F. L. Nord, discussed the subject of Preventive Dentistry from every aspect.

Social activities were organized on an ambitious scale, and there were receptions given by the Dutch Government and the Municipality of The Hague in the Hall of the Knights, which is normally only used for important State occasions.

The Council of the F.D.I. met on the Sunday and Monday preceding the meeting, and on Tuesday, June 8, the Annual Meeting was opened officially by Professor Dr. P. Muntendam, Director General of Public Health in the Netherlands. This was immediately followed by the first meeting of the General Assembly at which official and alternate delegates and observers from some twenty countries were present.

The various Commissions of the F.D.I. started their work on the Wednesday morning and presented their reports to the Council and

General Assembly at the end of the week. The subjects discussed included the preparation of the Scientific Programme of the XIIth International Dental Congress to be held in Rome, in 1957, and progress reports by sub-Committees on Documentation, Dental Materials, Terminology, and Caries Recording Methods under the ægis of the Scientific Commission.

Arrangements were made to hold the Annual Meeting of the F.D.I. in Copenhagen, in July, 1955, and an additional meeting in Athens in October of the same year.

NATIONAL HEALTH SERVICE NOTES

Replacement of Orthodontic Appliances

A NUMBER of cases have come to notice in which, when an orthodontic appliance supplied under the general dental services has been lost or damaged, the patient (or his or her parents) has been anxious to obtain a speedy replacement and has, therefore, been willing to pay the whole cost at once rather than to submit to the delay which necessarily takes place while his liability under Regulation 25 of the National Health Service (General Dental Services) Regulations, 1954, is being considered. Hardship will, in a number of cases, be avoided if patients are given an opportunity of provisionally paying the whole cost of replacement, subject to the right to be given a refund of the whole or part of this payment if the Executive Council should so decide after considering the patient's liability under Regulation 25. It has, therefore, been decided to institute the following procedure for an experimental period.

The dentist will submit an estimate to the Dental Estimates Board for prior approval in the usual way. If the Board decides to approve the replacement on clinical grounds but considers there is a prima facie case that the appliance previously supplied requires replacement through lack of care, it will inform the dentist to this effect and will return the estimate to him marked "Approved subject to the patient's liability under Regulation 25". The Board will, at the same time, inform the Executive Council and the patient, explaining to the latter that if, in order to secure speedy replacement, he should wish to make provisional payment to his dentist of the full amount, he may do so and a refund will be made to him if it should be decided by the Council that he is not liable for the whole or any part of the amount he has paid.

If the patient elects to take advantage of this arrangement, he should inform both his dentist and the Council, and the dentist will then be entitled to proceed with the provision of the replacement without waiting for formal prior approval and to receive from the patient the whole fee approved by the Board for the replacement. The Council will consider in the usual way the question of the patient's liability under Regulation 25. The refund, if any, will be made to the patient by the Council on his producing the dentist's receipt. The Council will inform the Dental Estimates Board.

Sir Isaac Pitman & Sons Ltd. have now taken over the Lippincott range of medical books, and will publish these books throughout the world, except in the U.S.A., Canada, Australia, and the Philippines.

A new company, Pitman Medical Publishing Co. Ltd., has been formed to take charge of this arrangement, and to take over Pitman's own medical books. The offices of the new company will be at 45, New Oxford Street, London, W.C.1.

"Sterispon", an absorbable gelatin sponge manufactured by Allen & Hanbury is now available in a new size, No. 5 (2 cm. × 2 cm. × 1 cm.).

This size has been specially developed for use in dental surgery, and is particularly suitable for securing hæmostasis in bleeding tooth sockets after extraction. Sterispon No. 5 is supplied in tubes of 6 pieces.

BOOK REVIEW

ESSENTIALS OF REMOVABLE PARTIAL DENTURE PROSTHESIS. By OLIVER C. APPLEGATE, D.D.S., D.D.Sc., F.A.C.D., Professor of Dentistry, School of Dentistry, and W. K. KELLOGG, Foundation Institute: Graduate and Post-graduate Dentistry, University of Michigan. $10\frac{7}{8} \times 8\frac{1}{2}$ in. Pp. 323 + xxii, with 352 illustrations (10 in colour). 1954. Philadelphia and London: W. B. Saunders Co. 50s.

VICTOR STEFFEL, one of America's leading prosthodontists, has divided the approach to partial denture construction into three definite schools of thought:—

1. Those who believe that the denture should be stress broken, using frictional attachments with a minimum of tooth engagement.

2. The school of thought which provides the denture with a few direct retainers which are freely movable and a mucosal contact base which fits the tissues during function.

3. The third approach is that of multiple clasps, rests, and lugs, which produce a rigid tooth-borne appliance.

Dr. Oliver Applegate in his book *The Essentials of Removable Partial Denture Prosthesis* (a title apt to mislead in its indication that the contents comprise all the above) favours the second approach to denture construction. He has endeavoured to present a logical approach and clinical technique for making partial dentures.

He contends that a registration of the oral structures under the stress of mastication will give a denture a longer life and cause less trauma to the remaining teeth, and preserve the ridge from dissolution. The author and his associates, with this belief in mind, have spent many years perfecting materials to permit impressions to be taken of the oral tissues in function.

The first part of this book has been devoted to a discussion of the Kennedy classification of partial denture design and of the planning and application of the various components: the direct and indirect retainers, rests, connectors, and base. At this point the author describes the technique for the impression. He makes a hard wax or resin bite which is attached to the metal casting. This is rebased from a functional impression taken with soft-flowing waxes. A description of occlusal registrations follows and their use with a straight-line articulator.

The second section of the text deals with practical procedures to be adopted in carrying this technique from the original mouth examination through the chairside technique to the laboratory work involved in producing the finished denture.

Dr. Applegate has employed a novel—and easily readable—method in the text by using the question and answer technique on the right-hand pages, while those on the left are mainly used for illustration and detailed captions. The pictures are extremely well produced, if occasionally too small adequately to show some of the points the author is demonstrating.

The publishers are to be congratulated on the use of the quarto page, intelligent and imaginative use of type faces (so rare in text-books), and particularly of upper case type in stressing Dr. Applegate's main points. It makes an easily held and readable book and a valuable contribution to dental literature.

One cannot hesitate in recommending it to all interested in dental prosthetics and as a model for future authors of dental text-books.

D. D. D.

The SEMAINE ODONTOLOGIQUE (Odontological Week), 62nd Dental Congress, placed under the High Patronage of the President of the French Republic, will be held in Paris from March 31 to April 6, 1955.

The "Semaine Odontologique" is organized by the National Confederation of Dental Syndicates.

The large Exhibition of Dental Equipment and Products, which in 1953 *covered an area of* 54,000 *square feet, will have in* 1955 *a Foreign Section.*

For information, apply to: M. Maurice Vincent, Secrétaire Général de la Semaine Odontologique, 31, rue Tronchet, Paris (8e).

BRITISH DENTAL STUDENTS' ASSOCIATION

FOURTEENTH ANNUAL CONGRESS

THE Fourteenth Annual Congress of the British Dental Students' Association was held on August 23–26, 1954, at the Dundee Dental Hospital and School, Dundee. The programme was arranged entirely by the host school and was of a wide and varied nature, embodying business, clinical, and social activities.

The Opening Ceremony was held in the Students' Union, where speeches of welcome were made by Baillie Mrs. Holway, on behalf of the Lord Provost and citizens of Dundee; by Professor A. D. Hitchin, on behalf of the University of St. Andrews and the Faculty of Medicine; and by Mr. W. F. Speirs, President of the Dundee Dental Students' Society, on behalf of the Society. The Student President of B.D.S.A. replied on behalf of the delegates.

In his Presidential Address, Professor Hitchin spoke of "Personalities in Dentistry". The lecture was fully illustrated with coloured lantern slides, many of which were taken at the 1952 Congress of the Fédération Dentaire Internationale in London. At the reception and tea given afterwards by the Council of Queen's College, Dundee, the Dean of the Faculty of Medicine of the University of St. Andrews, Professor G. H. Bell, chatted with the delegates.

The Annual General Meeting covered many aspects of student and professional interest. The discussions were full, lively, and, at times, controversial, including such topics as student health, grants and welfare problems, international dental student relationships, dental hypnosis, and amendments to the Association's Constitution. For the first time in the history of the Association the British Dental Association had appointed an official observer to the meeting. On this occasion B.D.S.A. was privileged to welcome Mr. W. R. Tattersall, the Chairman of the Representative Board of the B.D.A. Particular thanks of the Association were expressed by the Student Treasurer to the members of the Dental Trade who had contributed towards the "Delegates Travelling Fund", which has been established to assist students to attend British and International Dental Student Conferences.

Clinical aspects of the programme included a lecture by Mr. J. M. Fairley, Lecturer in Operative Dental Surgery in the Dundee School, entitled, "Some Cases from the Conservation Department". The lecture, which was illustrated with coloured lantern slides, left no doubt in the minds of the delegates that Dundee can be justifiably proud of its porcelain traditions. Demonstrations by members of the Departments of Oral Surgery, Parodontia, Orthodontics, Prosthetics, and Conservation had been most carefully prepared and were fully attended. The F. H. Wright Dental Company (Dundee) welcomed the delegates to their showrooms, and after a film explaining the processes involved in the production of porcelain artificial teeth, and demonstrations by Mr. Maddens of the Amalgamated Dental Company on "Sevriton" and "Zelex", entertained the whole Congress to lunch at the Royal British Hotel, Dundee.

Social events included an evening bus ride to the Hydro-electric Plant at Pitlochry, a conducted tour around the colleges and chapel of the University of St. Andrews, a dance, and a party to the local repertory theatre. Still away from dentistry, the delegates enjoyed a conducted tour followed by tea, around one of the model factories of the National Cash Register Company.

The Annual Dinner of the Association was held on the last evening of the Congress at the Royal Hotel, Dundee. The guests included Mr. W. R. Tattersall, Mrs. A. D. Hitchin, and members of the staff of the Dundee Dental Hospital and School.

Without doubt this has been one of the most successful Congresses of the British Dental Students' Association and the thanks of the whole Association and particularly of the delegates present are due to Professor Hitchin and the Dundee Dental Students' Society for their untiring efforts to organize such a full and varied programme.